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# Best Demonstrated Available Technology (BDAT) Background Document for Wastes from the Production of 1, 1, 1-Trichloroethane K028, K029, K095, and K096

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This background document provides the Agency's rationale and technical support for selecting the constituents regulated in K028, K029, K095, and K096 non-wastewaters and K028 wastewaters and for developing treatment standards for these constituents. This document also provides waste characterization data that serve as a basis for determining whether a variance from treatment standards may be warranted for a particular type of K028, K029, K095, or K096 waste that is more difficult to treat than the wastes that were analyzed in dveloping the treatment standards for K028, K029, K095, and K096 non-wastewaters and K028 wastewaters.

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FINAL

# BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT)

# BACKGROUND DOCUMENT

FOR WASTES FROM THE PRODUCTION OF

1,1,1-TRICHLOROETHANE

K028, K029, K095, AND K096

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# 1.0 INTRODUCTION

In accordance with the amendments to the Resource Conservation and Recovery Act (RCRA) of 1976, enacted in the Hazardous and Solid Waste Amendments (HSWA) of November 8, 1984, the Environmental Protection Agency (EPA) is establishing best demonstrated available technology (BDAT) treatment standards for the listed wastes identified in Title 40, Code of Federal Regulations, Section 261.32 (40 CFR 261.32) as K028, K029, K095, and K096 from the production of 1,1,1-trichloroethane. Compliance with these BDAT treatment standards is a prerequisite under 40 CFR Part 268 for placement of these wastes in units designated as land disposal units. The BDAT treatment standards are effective as of June 8, 1989.

This background document provides the Agency's rationale and technical support for selecting the constituents regulated in K028, K029, K095, and K096 nonwastewaters and K028 wastewaters and for developing treatment standards for these constituents. This document also provides waste characterization data that serve as a basis for determining whether a variance from treatment standards may be warranted for a particular type of K028, K029, K095, or K096 waste that is more difficult to treat than the wastes that were analyzed in developing the treatment standards for K028, K029, K095, and K096 nonwastewaters and K028 wastewaters.

The Agency's legal authority and promulgated methodology for establishing treatment standards and the petition process necessary for requesting

a variance from the treatment standards are summarized in EPA's Methodology for Developing BDAT Treatment Standards (Reference 16).

This background document presents the following waste-specific information: the numbers and locations of facilities that may be affected by the land disposal restrictions for K028, K029, K095, and K096; the processes generating these wastes; the waste characterization data; the technologies used to treat the wastes (or similar wastes, if any); and the treatment performance data on which the treatment standards are based, if appropriate. This document also explains how EPA determines BDAT, selects constituents to be regulated, and calculates treatment standards.

Under 40 CFR 261.32, waste codes K028, K029, K095, and K096, which are generated in the production of 1,1,1-trichloroethane, are defined as follows:

| Waste Code | Listed Waste |
|---|---|
| K028 | Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane |
| K029 | Waste from the product steam stripper in the production of 1,1,1-trichloroethane |
| K095 | Distillation bottoms from the production of 1,1,1-trichloroethane |
| K096 | Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane |

The four-digit Standard Industrial Classification (SIC) code associated with the production of chlorinated organic chemicals is 2869. The Agency believes

there are three facilities manufacturing 1,1,1-trichloroethane in the United States that could potentially generate these listed wastes.

The Agency is regulating ten organic constituents in K028 nonwastewaters and ten organic constituents and four metal constituents in K028 wastewaters. The Agency is reserving treatment standards for metal constituents in K028 nonwastewaters. The Agency is also regulating five organic constituents in K029 nonwastewaters, seven organic constituents in K095 nonwastewaters, and eight organic constituents in K096 nonwastewaters. No metal constituents are being regulated in K029, K095, or K096 nonwastewaters and wastewaters. Treatment standards for K029, K095, and K096 wastewaters are not being promulgated at this time. To determine the applicability of the treatment standards, wastewaters are defined as wastes containing less than 1% (weight basis) total suspended solids[1] (TSS) and less than 1% (weight basis) total organic carbon (TOC). Wastes not meeting this definition are classified as nonwastewaters and must comply with the nonwastewater treatment standards.

The Agency does not have any performance data for treatment of K028, K029, K095, or K096. Treatment performance tests for these wastes have not

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[1]The term "total suspended solids" (TSS) clarifies EPA's previously used terminology of "total solids" and "filterable solids." Specifically, total suspended solids is measured by Method 209C (total suspended solids dried at 103-105°C) in Standard Methods for the Examination of Water and Wastewater, Sixteenth Edition (Reference 23).

been pursued because the Agency believes that adequate treatment performance data are available from similar wastes previously tested by the BDAT program. Therefore, treatment performance data were transferred from other previously tested wastes to develop treatment standards for K028, K029, K095, and K096 nonwastewaters and K028 wastewaters.

For K028, K029, K095, and K096 nonwastewaters, BDAT treatment standards for organic constituents are based on treatment performance data transferred from treatment of the ash residual from incineration of K019. As discussed previously, the Agency is reserving BDAT treatment standards for metal constituents in K028 nonwastewaters. The Agency is currently evaluating treatment performance data from stabilization of ash from the incineration of F024. Accordingly, the Agency may modify the proposed treatment standards for metals in K028 nonwastewaters at a later date.

For K028 wastewaters, the BDAT treatment standards for organic constituents are based on treatment performance data transferred from the scrubber water residual from incineration of K019. BDAT treatment standards for metal constituents in K028 wastewaters are based on treatment performance data transferred from the effluent from lime and sulfide precipitation and vacuum filtration of a mixture of K062 and metal-bearing characteristic wastes.

The tables following this section list the specific BDAT treatment standards for K028, K029, K095, and K096 nonwastewaters and K028 wastewaters.

Treatment standards for organic constituents regulated in K028, K029, K095, and K096 nonwastewaters and organic and metal constituents regulated in K028 wastewaters are based on the total concentration of each constituent in the waste.

The units used for total constituent concentration of organic constituents in K028, K029, K095, and K096 nonwastewaters are mg/kg (parts per million on a weight-by-weight basis). The units used for total constituent concentration of organic and metal constituents in K028 wastewaters are mg/l (parts per million on a weight-by-volume basis) for wastewaters. If the concentrations of the regulated constituents in K028, K029, K095, and K096 nonwastewaters and K028 wastewaters, as generated, are lower than or equal to the promulgated treatment standards, then treatment of the waste is not required prior to land disposal.

BDAT TREATMENT STANDARDS FOR K028
NONWASTEWATERS

| | Maximum for Any Single Grab Sample |
|---|---|
| BDAT List Organic Constituents | Total Concentration (mg/kg) |
| 22. 1,1-Dichloroethane | 6.0 |
| 25. trans-1,2-Dichloroethene | 6.0 |
| 40. 1,1,1,2-Tetrachloroethane | 5.6 |
| 41. 1,1,2,2-Tetrachloroethane | 5.6 |
| 42. Tetrachloroethene | 6.0 |
| 45. 1,1,1-Trichloroethane | 6.0 |
| 46. 1,1,2-Trichloroethane | 6.0 |
| 111. Hexachlorobutadiene | 5.6 |
| 113. Hexachloroethane | 28.0 |
| 137. Pentachloroethane | 5.6 |
| BDAT List Metal Constituents | TCLP Leachate Concentration (mg/l) |
| 159. Chromium (total) | Reserved |
| 163. Nickel | Reserved |

BDAT TREATMENT STANDARDS FOR K028
WASTEWATERS

| | Maximum for Any Single Grab Sample |
|---|---|
| BDAT List Organic Constituents | Total Concentration (mg/l) |
| 22. 1,1-Dichloroethane | 0.007 |
| 25. trans-1,2-Dichloroethene | 0.033 |
| 40. 1,1,1,2-Tetrachloroethane | 0.007 |
| 41. 1,1,2,2-Tetrachloroethane | 0.007 |
| 42. Tetrachloroethene | 0.007 |
| 45. 1,1,1-Trichloroethane | 0.007 |
| 46. 1,1,2-Trichloroethane | 0.007 |
| 111. Hexachlorobutadiene | 0.007 |
| 113. Hexachloroethane | 0.033 |
| 137. Pentachloroethane | 0.007 |
| BDAT List Metal Constituents | Total Concentration (mg/l) |
| 158. Cadmium | 6.4 |
| 159. Chromium (total) | 0.35 |
| 161. Lead | 0.037 |
| 163. Nickel | 0.47 |

BDAT TREATMENT STANDARDS FOR K029
NONWASTEWATERS

| BDAT List Organic Constituents | Maximum for Any Single Grab Sample Total Concentration (mg/kg) |
|---|---|
| 14. Chloroform | 6.0 |
| 23. 1,2-Dichloroethane | 6.0 |
| 24. 1,1-Dichloroethylene | 6.0 |
| 45. 1,1,1-Trichloroethane | 6.0 |
| 50. Vinyl chloride | 6.0 |

BDAT TREATMENT STANDARDS FOR K095
NONWASTEWATERS

| BDAT List Organic Constituents | | Maximum for any Single Grab Sample Total Concentration (mg/kg) |
|---|---|---|
| 40. | 1,1,1,2-Tetrachloroethane | 5.6 |
| 41. | 1,1,2,2-Tetrachloroethane | 5.6 |
| 42. | Tetrachloroethene | 6.0 |
| 46. | 1,1,2-Trichloroethane | 6.0 |
| 47. | Trichloroethene | 5.6 |
| 113. | Hexachloroethane | 28.0 |
| 137. | Pentachloroethane | 5.6 |

BDAT TREATMENT STANDARDS FOR K096
NONWASTEWATERS

| BDAT List Organic Constituents | Maximum for Any Single Grab Sample Total Concentration (mg/kg) |
|---|---|
| 40. 1,1,1,2-Tetrachloroethane | 5.6 |
| 41. 1,1,2,2-Tetrachloroethane | 5.6 |
| 42. Tetrachloroethene | 6.0 |
| 46. 1,1,2-Trichloroethane | 6.0 |
| 47. Trichloroethene | 5.6 |
| 86. 1,3-Dichlorobenzene | 5.6 |
| 137. Pentachloroethane | 5.6 |
| 150. 1,2,4-Trichlorobenzene | 19.0 |

## 2.0 INDUSTRY AFFECTED AND WASTE CHARACTERIZATION

The Hazardous and Solid Waste Amendments (HSWA) specify dates after which particular groups of hazardous wastes will be prohibited from land disposal. The amendments also require the U.S. EPA to establish treatment standards for each waste that, when met, will allow that waste to be land disposed. Wastes generated in the production of 1,1,1-trichloroethane are part of the second-third of the scheduled listed wastes to be evaluated by the Agency for land disposal restrictions. This section describes the industry affected by the land disposal restrictions for K028, K029, K095, and K096 and the processes generating the wastes, and presents available waste characterization data for these wastes.

Wastes identified as K028, K029, K095, and K096 are specifically generated by the 1,1,1-trichloroethane manufacturing process and are defined in 40 CFR 261.32 as follows:

| Waste Code | Listed Waste |
|---|---|
| K028 | Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane |
| K029 | Waste from the product steam stripper in the production of 1,1,1-trichloroethane |
| K095 | Distillation bottoms from the production of 1,1,1-trichloroethane |
| K096 | Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane |

## 2.1 Industry Affected and Process Description

Three facilities in the United States are known to currently generate K028, K095, or K096 based on correspondence with these facilities. The facilities, their locations, the EPA Regions in which they are located, and their associated waste codes are listed below. None of the facilities currently generate K029.

Facilities Generating K028, K095, or K096

| Facility | Location | EPA Region | Wastes Generated |
|---|---|---|---|
| Dow Chemical Company, U.S.A. | Freeport, TX | VI | K028 |
| PPG Industries, Inc. | Lake Charles, LA | VI | K028, K095 |
| Vulcan Materials Co. | Geismar, LA | VI | K028, K096 |

1,1,1-Trichloroethane is produced commercially by the catalytic hydrochlorination of vinyl chloride. A simplified flow diagram illustrating the 1,1,1-trichloroethane manufacturing process and the generation of K028, K029, K095, and K096 is presented in Figure 2-1. Vinyl chloride and hydrogen chloride are reacted in the presence of a ferric chloride catalyst to produce a 1,1-dichloroethane intermediate. Spent catalyst is separated from the product stream via filtration or distillation. The spent catalyst stream is then the listed waste K028. Heavy ends from the heavy ends column, if used, comprise K096. The heavy ends column is generally placed before the secondary chlorination reactor to remove heavy ends prior to chlorination of the product stream. Light ends may also be removed via distillation and recycled to the

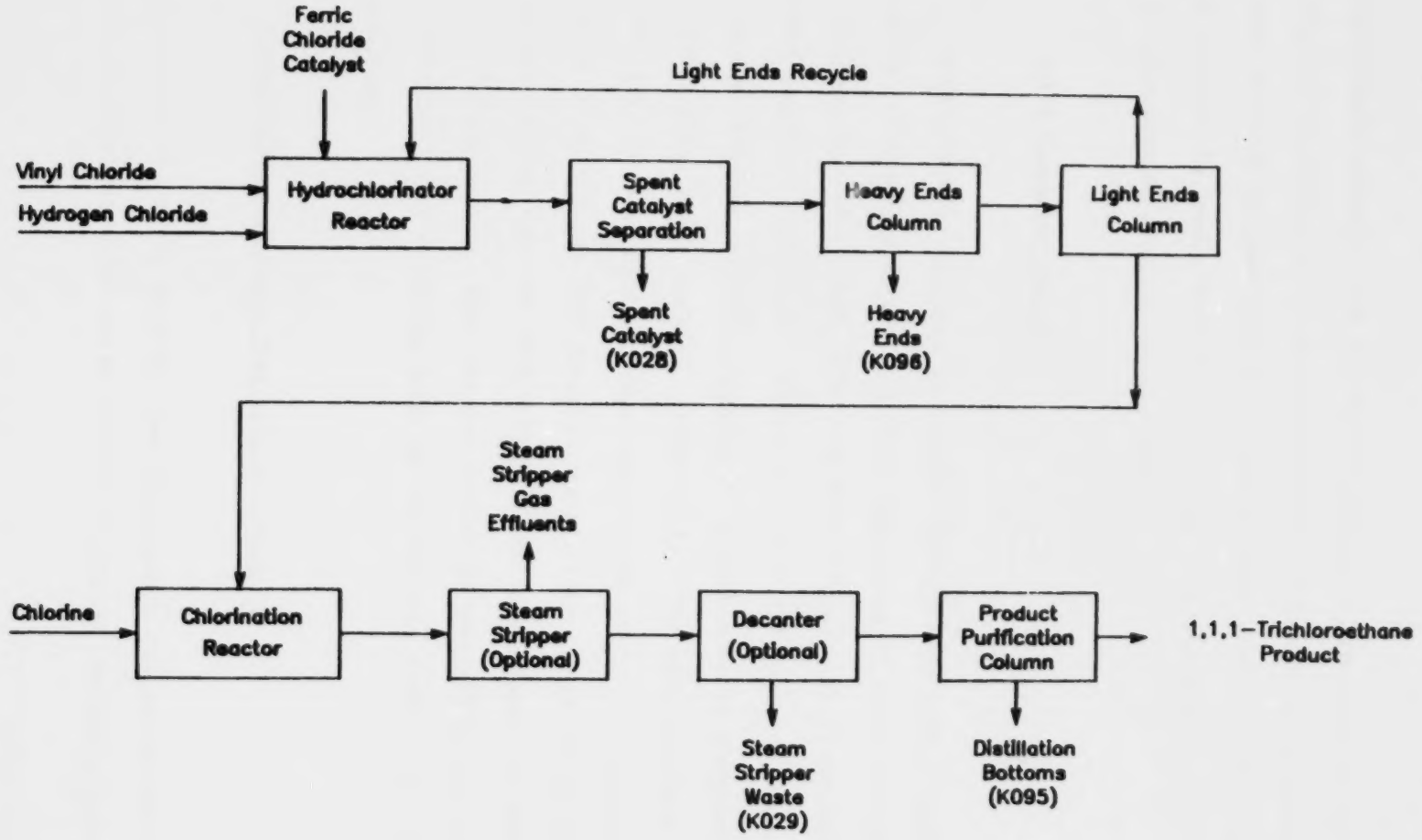


Figure 2-1. Simplified Flow Diagram for Production of 1,1,1-Trichloroethane

hydrochlorinated reactor. The 1,1-dichloroethane intermediate is then reacted with chlorine to produce 1,1,1-trichloroethane. Although not currently generated, K029 may be generated as a steam stripper waste in processes where a steam stripper is used. Distillation bottoms from the final purification of 1,1,1-trichloroethane product comprise K095.

## 2.2 Waste Characterization

K028 generally consists of greater than 50% chlorinated organic constituents, with the balance of the waste consisting of heavy tars and ferric chloride catalyst. K029, K095, and K096 are expected to contain 100% chlorinated organic constituents. Tables 2-1, 2-2, 2-3, and 2-4, presented at the end of this section, provide a summary of available waste characterization data for K028, K029, K095, and K096, respectively. The data presented for K028, K095, and K096 were obtained from sampling and analysis conducted by EPA's Office of Solid Waste land disposal restrictions and relisting programs. Waste characterization data for K029 were obtained from a report by Environ Corporation (Reference 19). K029 was not sampled or analyzed by the land disposal restrictions or relisting programs because this waste is not currently generated.

## 2.3 Determination of Waste Treatability Groups

In cases where EPA believes that constituents present in wastes represented by different codes can be treated to similar concentrations using

the same technology, the Agency may combine the wastes into one treatability group. K028, K029, K095, and K096 are all generated by the same industry (chlorinated organic chemicals industry) and the same process (production of 1,1,1-trichloroethane). Based on the waste characterization data presented in Tables 2-1 through 2-4, K028, K029, K095 and K096 contain many of the same constituents at similar concentrations and can be treated by the same treatment technologies. Based on these similarities, the Agency has determined that K028, K029, K095, and K096 represent a single waste treatability group.

Table 2-1

SUMMARY OF AVAILABLE CHARACTERIZATION DATA FOR K028

| | Concentration in Untreated Waste | | | | |
|---|---|---|---|---|---|
| | (a) | (b) | (c) | (d) | Range |
| **BDAT LIST ORGANICS** | | | | | |
| **Volatiles** | (ppm) | (ppm) | (ppm) | (ppm) | (ppm) |
| 22. 1,1-Dichloroethane | • | • | 1,082,000* | • | 16,000-1,082,000* |
| 25. trans-1,2-Dichloroethene | • | • | <50,000 | • | ND-1,700 |
| 40. 1,1,1,2-Tetrachloroethane | • | • | <50,000 | • | ND-200,000 |
| 41. 1,1,2,2-Tetrachloroethane | • | • | <50,000 | • | ND-53,000 |
| 42. Tetrachloroethene | • | • | <50,000 | • | ND-6,500 |
| 45. 1,1,1-Trichloroethane | • | • | <50,000 | • | ND-1,900 |
| 46. 1,1,2-Trichloroethane | • | • | <50,000 | • | ND-300,000 |
| **Semivolatiles** | | | | | |
| 111. Hexachlorobutadiene | • | • | <94 | • | ND-170 |
| 113. Hexachloroethane | • | • | <94 | • | ND-170 |
| 137. Pentachloroethane | • | • | ND | • | ND-6,900 |
| **BDAT LIST METALS** | | | | | |
| 156. Barium | --- | --- | 17 | --- | 17 |
| 158. Cadmium | --- | --- | 0.6 | --- | 0.6 |
| 159. Chromium (total) | --- | --- | 109 | --- | 109 |
| 160. Copper | --- | --- | 132 | --- | 132 |
| 161. Lead | --- | --- | 42 | --- | 42 |
| 163. Nickel | --- | --- | 70 | --- | 70 |
| 167. Vanadium | --- | --- | 1.3 | --- | 1.3 |
| 168. Zinc | --- | --- | 78 | --- | 78 |

(a) Source: Relisting analytical data report (Reference 3).
(b) Source: Relisting analytical data report (Reference 4).
(c) Source: Characterization report for Dow Chemical Company, Freeport, TX (Reference 1).
(d) Source: Relisting analytical data report (Reference 2).

--- Not analyzed.
ND Not detected at or above the detection limit; the detection limit was not reported.

* Although quantitated at 108%, this value is estimated to range from 75-100%, based on discussions with laboratory personnel. Variability in this value is due to the quantity of this constituent in the sample and the dilution factor of 10,000,000 used to analyze this constituent within the calibration range of the instrument.

• This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 2-1 (Continued)

SUMMARY OF AVAILABLE CHARACTERIZATION DATA FOR K028

| | Concentration in Untreated Waste | | | | |
|---|---|---|---|---|---|
| | (a) | (b) | (c) | (d) | Range |
| BDAT LIST METALS (TCLP) | (ppm) | (ppm) | (ppm) | (ppm) | (ppm) |
| 154. Antimony | --- | --- | 0.134 | --- | 0.134 |
| 156. Barium | --- | --- | 2.13 | --- | 2.13 |
| 157. Beryllium | --- | --- | 0.0049 | --- | 0.0049 |
| 159. Chromium, total | --- | --- | 1.33 | --- | 1.33 |
| 160. Copper | --- | --- | 4.21 | --- | 4.21 |
| 161. Lead | --- | --- | 1.17 | --- | 1.17 |
| 162. Mercury | --- | --- | 0.0012 | --- | 0.0012 |
| 163. Nickel | --- | --- | 4.63 | --- | 4.63 |
| 167. Vanadium | --- | --- | 0.353 | --- | 0.353 |
| 168. Zinc | --- | --- | 5.43 | --- | 5.43 |
| OTHER PARAMETERS | | | | | |
| Free Liquid (% by volume) | --- | --- | 88** | --- | 88** |
| Flash Point ($^{o}$F) | --- | --- | <77 | --- | <77 |
| Density (g/ml) | --- | --- | 1.2** | --- | 1.2** |
| Total Solids (%) | • *** | • *** | 25.7 | • *** | 0.08-100*** |
| Ash Content (%) | --- | --- | 44.6 | --- | 4.6 |
| Oil and Grease (mg/kg) | --- | --- | 33,500+ | --- | 33,500+ |
| Total Halogens (mg/l) | --- | --- | 551,000 | --- | 551,000 |
| Heating Value (BTU/lb) | --- | --- | 5,685 | --- | 5,685 |
| Viscosity (centistokes) | --- | --- | 0.891 | --- | 0.891 |

(a) Source: Relisting analytical data report (Reference 3).
(b) Source: Relisting analytical data report (Reference 4).
(c) Source: Characterization report for Dow Chemical Company, Freeport, TX (Reference 1).
(d) Source: Relisting analytical data report (Reference 2).

--- Not analyzed.
ND Not detected at or above the detection limit; the detection limit was not reported.

** This value should be considered approximate due to the problems associated with rapid sample drying.
*** Measured on a dry basis.
+ Liquid sample was analyzed and treated as a solid. Results are reported on a wet-as-received basis.

• This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 2-1 (Continued)

SUMMARY OF AVAILABLE CHARACTERIZATION DATA FOR K028

| | Concentration in Untreated Waste | | | | |
|---|---|---|---|---|---|
| | (a) | (b) | (c) | (d) | Range |
| **OTHER PARAMETERS** (Continued) | | | | | |
| Chloride Content (mg/kg) | --- | --- | 28,900+ | --- | 28,900+ |
| Carbon Content (%) | --- | --- | 19.1 | --- | 19.1 |
| Biological Oxygen Demand (mg/l) | --- | --- | 2,930++ | --- | 2,930++ |
| Chemical Oxygen Demand (mg/l) | --- | --- | 281,000 | --- | 281,000 |
| Water Solubility | --- | --- | Insoluble | --- | Insoluble |
| Manganese (ppm) | --- | --- | 472 | --- | 472 |
| Sodium (ppm) | --- | --- | 36 | --- | 36 |
| Silicon (ppm) | --- | --- | 29 | --- | 29 |



(a) Source: Relisting analytical data report (Reference 3).
(b) Source: Relisting analytical data report (Reference 4).
(c) Source: Characterization report for Dow Chemical Company, Freeport, TX (Reference 1).
(d) Source: Relisting analytical data report (Reference 2).

--- Not analyzed.

\+ Liquid sample was analyzed and treated as a solid. Results are reported on a wet-as-received basis.
++ Result is probably biased low due to the suspected sample toxicity towards the biological oxygen demand seed.

Table 2-2

SUMMARY OF AVAILABLE CHARACTERIZATON DATA FOR K029

| BDAT LIST ORGANICS | Concentration in Untreated Waste (%) (a) |
|---|---|
| **Volatiles** | |
| 14. Chloroform | * |
| 23. 1,2-Dichloroethane | 17 |
| 24. 1,1-Dichloroethylene | * |
| 45. 1,1,1-Trichloroethane | 83 |
| 50. Vinyl Chloride | * |

(a) Source: Environ report (Reference 19).

*This constituent is expected to be present in K029. However, no quantitative data are available.

Table 2-3

SUMMARY OF AVAILABLE CHARACTERIZATION DATA FOR K095

| | Concentration in Untreated Waste (%) (a) |
|---|---|
| BDAT LIST ORGANICS | |
| **This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.** | |

(a) Source: Relisting analytical data report (Reference 2).

Table 2-4

SUMMARY OF AVAILABLE CHARACTERIZATION DATA FOR K096

Concentration in Untreated Waste (%)

BDAT LIST ORGANICS

**This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.**

(a) Source: Relisting analytical data report (Reference 3).

# 3.0 APPLICABLE AND DEMONSTRATED TREATMENT TECHNOLOGIES

Available characterization data for K028, K029, K095, and K096 were presented in Section 2.0. This section identifies the treatment technologies that are applicable to these wastes and determines which, if any, of the applicable technologies can be considered demonstrated for the purpose of establishing BDAT.

To be applicable, a technology must theoretically be usable to treat the waste in question or to treat a waste that is similar in terms of parameters that affect treatment selection. (Detailed descriptions of technologies that are applicable to listed hazardous wastes are provided in EPA's Treatment Technology Background Document (Reference 17)). To be demonstrated, a technology must be employed in full-scale operation for treatment of the waste in question or a similar waste. Technologies available only at pilot- or bench-scale operations are not considered in identifying demonstrated technologies.

## 3.1 Applicable Treatment Technologies

The following subsections present applicable treatment technologies for K028, K029, K095, and K096 nonwastewaters and K028 wastewaters.

### 3.1.1 K028, K029, K095, and K096 Nonwastewaters

Since K028, K029, K095, and K096 nonwastewaters contain high concentrations of organic compounds (as shown in Section 2.0), applicable treatment

technologies include those that destroy or reduce the total amount of various organic compounds in the waste. The Agency has identified the following treatment technologies as applicable for these wastes: (1) incineration (fluidized bed and rotary kiln) followed by stabilization of incinerator ash and chemical precipitation and filtration of scrubber water; (2) solvent extraction followed by incineration or recycle of the extract; and (3) critical fluid extraction followed by incineration of the contaminated solvents. Total recycle or reuse has also been identified as an applicable treatment technology for K095 and K096 nonwastewaters. These treatment technologies were identified based on current waste treatment practices and engineering judgment.

Incineration. Incineration is a destruction technology in which energy, in the form of heat, is transferred to the waste to destabilize chemical bonds and destroy hazardous organic constituents. In a fluidized bed incinerator, waste is injected into the fluidized bed material (generally sand and/or incinerator ash), where it is heated to its ignition temperature. Heat energy from the combustion reactions is then transferred back to the fluidized bed. Ash is removed periodically during operation and during bed change-outs.

In a rotary kiln incinerator, wastes are fed into the elevated end of the kiln, and the rotation of the kiln mixes the waste with hot gases to heat the waste to its ignition temperature. Ash is removed from the lower end of the kiln. Combustion gases from the kiln enter the afterburner for

complete destruction of waste constituents. Other wastes may also be injected into the afterburner.

Combustion gases from the fluidized bed or kiln afterburner are then fed to a scrubber system for cooling and removal of entrained particulates and acid gases, if present. In general, two residuals are generated by incineration processes: ash and scrubber water. Metals and other inorganic constituents in incinerator ash can be treated using stabilization. Metals and other inorganic constituents in scrubber water can be treated using chemical precipitation and filtration.

Stabilization. Stabilization refers to a broad class of treatment processes that physically or chemically reduce the mobility of hazardous constituents in a waste by binding these constituents into a solid material that is resistant to leaching.

Chemical Precipitation and Filtration. Chemical precipitation and filtration are separation technologies in which metals are precipitated and removed from wastewaters. These technologies result in the generation of two treatment residuals: a treated wastewater and a precipitate. The precipitate may require further treatment by stabilization.

Solvent Extraction. Solvent extraction is a separation technology in which organics are removed from the waste due to greater constituent solubility in the solvent phase than in the waste phase. This technology results in the generation of two treatment residuals: a treated waste

residual and an extract. Metals and other inorganic constituents in the treated waste residual can be treated by stabilization. The extract may be recycled or further treated by incineration.

Critical Fluid Extraction. Critical fluid extraction is a solvent extraction technology in which the solvent is brought to its critical state to aid in the extraction of hazardous organic constituents from the wastes. After the extraction step, the solvent (liquified gas at its critical state) is brought back to its normal condition in the gaseous state, and generating a small volume of extract which is concentrated in hazardous organic constituents. This technology results in the generation of two treatment residuals: a treated waste and an extract. Metals and other inorganic constituents in the treated waste can be treated by stabilization. The extract may be recycled or further treated by incineration.

Total Recycle or Reuse. Total recycle or reuse of a waste in the same process or another process eliminates the generation of the waste and generates no treatment residuals.

### 3.1.2 K028 Wastewaters

The Agency recognizes that K028 wastewaters may also be generated from treatment technologies other than incineration. Since these wastewaters may contain hazardous organic constituents at treatable levels, applicable technologies include those that destroy or reduce the total amount of various organic compounds in the waste. Therefore, the Agency has identified the the

following treatment technologies as potentially applicable for treatment of K028 wastewaters: biological treatment, carbon adsorption, and solvent extraction. Hazardous metal and inorganic constituents are not expected to be present in K028 wastewaters, other than incineration scrubber water, at treatable levels.

Biological Treatment. Biological treatment is a destruction technology in which hazardous organic constituents in wastewaters are biodegraded. This technology results in the formation of two treatment residuals: a treated effluent and a waste biosludge. The treated effluent and the waste biosludge may require further treatment for metals by chemical precipitation and stabilization, respectively.

Carbon Adsorption. Carbon adsorption is a separation technology in which hazardous organic constituents in wastewaters are selectively adsorbed onto activated carbon. This technology results in the formation of two treatment residuals: a treated effluent and spent activated carbon. The treated effluent may require further treatment for metals by chemical precipitation. The spent carbon may require further treatment by incineration.

Solvent Extraction. Solvent extraction of wastewaters is identical to that described in Section 3.1.1 above.

## 3.2 Demonstrated Treatment Technologies

The following subsections present demonstrated treatment technologies for K028, K029, K095, and K096 nonwastewaters and K028 wastewaters.

### 3.2.1 K028, K029, K095, and K096 Nonwastewaters

The Agency has identified incineration (rotary kiln incineration and fluidized bed) as the demonstrated technology for treatment of K028 nonwastewaters. Rotary kiln incineration is demonstrated on a full-scale operational basis for treatment of K028 at two facilities. In addition, fluidized bed incineration is demonstrated on a full-scale basis for treatment of K028 at one facility. The Agency is not aware of any facilities that incinerate K029, K095, or K096; however, incineration is demonstrated on wastes judged to be similar, such as K028, K019, and F024. The Agency does not have treatment performance data for incineration of K028, K029, K095, and K096 nonwastewaters. However, for the BDAT program, the Agency tested rotary kiln incineration and fluidized bed incineration for similar wastes as discussed in Section 4.1.

The Agency is not aware of any facilities that treat metal constituents in ash from incineration of K028, K029, K095, or K096 by stabilization or by any other technology. However, stabilization is demonstrated on wastes judged to be similar, such as F024. The Agency does not have treatment performance data for stabilization of K028, K029, K095, or K096 incinerator

ash. However, for the BDAT program, the Agency tested stabilization for similar wastes as discussed in Section 4.2.

The Agency is not aware of any facilities that treat K028, K029, K095, K096 nonwastewaters or wastes judged to be similar on a full-scale operational basis using solvent extraction or critical fluid extraction; therefore, EPA believes that solvent extraction and critical fluid extraction are not currently demonstrated for these wastes.

Total recycle or reuse is demonstrated for treatment of K095 and K096 nonwastewaters. K095 generated at one facility is reused directly as feed stock in another chlorinated hydrocarbon production unit. K096 generated at one facility is either used as feed stock for a perchloroethylene/trichloroethylene process or is fed into a hydrochloric acid production furnace.

### 3.2.2 K028 Wastewaters

The Agency is not aware of any facilities that treat metal constituents in K028 wastewaters. However, chemical precipitation followed by filtration is demonstrated for similar wastewaters, such as K062. The Agency tested lime and sulfide precipitation and vacuum filtration for similar wastes, as discussed in Section 4.2.

## 4.0 TREATMENT PERFORMANCE DATA BASE

The Agency does not have any treatment performance data for treatment of K028, K029, K095, and K096 nonwastewaters or K028 wastewaters. Therefore, treatment performance data were transferred from other previously tested wastes to develop treatment standards for K028, K029, K095, and K096 nonwastewaters and K028 wastewaters. The basis for data transfer and the sources of treatment performance data are discussed below.

EPA's methodology for the transfer of treatment performance data is provided in EPA's Methodology for Developing BDAT Treatment Standards (Reference 16). Transfer of treatment performance data is technically valid in cases where the untested wastes are generated from similar industries or similar processing steps, or have similar waste characteristics affecting treatment performance and treatment selection, as the tested wastes. Sources of treatment performance data for potential transfer to K028, K029, K095, and K096 nonwastewaters and K028 wastewaters include wastes previously tested by rotary kiln or fluidized-bed incineration, followed by stabilization of incinerator ash, and lime and sulfide precipitation followed by vacuum filtration of scrubber water. (These technologies were identified as applicable and demonstrated for treatment of these wastes in Section 3.0.)

## 4.1 Treatment of Organic Constituents

Incineration. Wastes previously tested by the Agency by rotary kiln or fluidized-bed incineration include: K001, K019, K024, K037, K086, K087, K101, K102, F024, K048, and K051. EPA examined these wastes to identify the best data source(s), if any, for transfer of treatment performance data to K028, K029, K095, and K096 nonwastewaters and K028 wastewaters. Specifically, EPA examined whether the untested wastes are (1) generated from similar industries or processing steps and (2) whether the wastes have similar waste characteristics affecting treatment performance as these previously tested wastes.

Of the wastes previously tested by incineration, two wastes, F024 and K019, are generated from the chlorinated organic chemicals industry. Similar to K028, K029, K095, and K096, F024 and K019 are also generated by distillation, filtration, or some other type of separation process from the product stream. K019, like K028, K029, K095, and K096, is generated from the production of chlorinated ethanes and contains high concentrations of these constituents. F024 is generated from the production of chlorinated organic chemicals having a carbon content of one to five. Although F024 includes wastes from the production of chlorinated ethanes, the F024 feed streams treated by the Agency did not contain chlorinated ethanes at concentrations as high as those detected in the K019 that was tested.

As discussed in the Treatment Technology Background Document (Reference 17), waste characteristics that affect treatment performance for rotary

kiln and fluidized bed incineration include the thermal conductivity of the waste and the boiling points and bond dissociation energies of the constituents of concern. (Boiling points and bond dissociation energies of the constituents of concern for each waste are provided in Appendix B.) K028 contains high concentrations of iron (as ferric chloride catalyst) and is therefore expected to have a higher thermal conductivity than F024 and K019. The BDAT List constituents in K028, K029, K095, and K096 are also, in general, more volatile (i.e., have lower boiling points) and have lower bond dissociation energies than such constituents in F024 and K019. Therefore, based on thermal conductivity, boiling points, and bond dissociation energies, K028 is easier to treat than both F024 and K019.

Analytical testing data performed by the Agency show that K028 nonwastewaters are comprised primarily of 1,1-dichloroethane at very high concentrations of up to approximately 100%. This constituent was not found in the F024 wastes that were tested during the BDAT demonstrations at detection limits of up to 10,000 mg/kg. In K019 wastes this constituent was present at concentrations of only 2,200 mg/kg; however, 1,2-dichloroethane was present at concentrations of up to 130,000 mg/kg. Due to the similarities in structure of these two isomers and the fact that they were present in significant concentrations in K019 and not detected in F024, the Agency has determined that K028 wastes more closely resemble K019 wastes rather than F024 for the purposes of transferring BDAT treatment standards.

Other waste characterization data indicate that 1,1,1-trichloroethane is the major organic constituent in K029 nonwastewaters and is present at high concentrations of up to approximately 83%. This constituent was not found in the F024 wastes that were tested during the BDAT demonstrations. In K019 wastes this constituent was present at up to 81,000 mg/kg. Due to the face that 1,1,1-trichloroethane was present in significant concentrations in K019 and not detected in F024, the Agency has determined that K029 wastes more closely resemble K019 wastes rather than F024 wastes. This is further supported by the similarities in concentrations of 1,2-dichloroethane (i.e., 170,000 mg/kg in K029 and up to 130,000 mg/kg in K019 versus 2,700 mg/kg in F024.)

Characterization data also indicate that K095 and K096 wastes contain up to 580,000 mg/kg and 720,000 mg/kg, respectively, of 1,1,2-trichloroethane. The F024 wastes tested had only 891 mg/kg (maximum) of this constituent. While K019 had no detectable concentrations of this constituent, it did contain up to 81,000 mg/kg of 1,1,1-trichloroethane, which is an isomer of the 1,1,2-trichloroethane. Due to the similarities in structure of these two isomers and the significantly higher concentrations of the 1,1,1-trichloroethane in K019 wastes, the Agency has determined that K095 and K096 wastes more clearly resemble K019 wastes rather than F024.

Based on the similarities discussed above, treatment standards for organic constituents in K028, K029, K095, and K096 nonwastewaters and K028

wastewaters were developed from treatment performance data transferred from rotary kiln incineration of K019 at Plant A.

K019 and three other wastes, referred to as "RCRA Blend", "PCB Blend", and "mercaptan-contaminated waste" were treated at Plant A. K019 and RCRA Blend were fed to the rotary kiln; PCB Blend and mercaptan-contaminated waste were fed to the afterburner (secondary combustor). Ash generated from rotary kiln incineration represents treatment of the K019 and RCRA Blend wastes only, while scrubber water represents treatment of all the wastes fed to the incinerator. Table 4-1 presents the BDAT List constituents detected in the untreated wastes (K019, RCRA Blend, PCB Blend, and mercaptan-contaminated waste) collected by EPA from the rotary kiln incineration treatment system at Plant A. (All tables are presented at the end of this section.) Table 4-2 presents the BDAT List constituents detected in the kiln ash residual at Plant A, and Table 4-3 presents the BDAT List constituents detected in the scrubber water residual at Plant A. Design and operating data for the rotary kiln and the secondary combustor at Plant A are presented in Table 4-4.

## 4.2 Treatment of Inorganic Constituents

Stabilization. EPA presented data for stabilization of metals in nonwastewaters in the California List Notice of Data Availability (52 Federal Register 29992, August 12, 1987) (Reference 15). Data are available for stabilization of F006 and K062 at Plant J. The Agency also has data for pilot-scale stabilization at Plant C of incinerator ash generated from

fluidized bed incineration of K048 and K051 at Plant B. The Agency has also obtained and is currently evaluating data for pilot-scale stabilization at Plant C of incinerator ash generated from rotary kiln incineration of F024 at Plant I. EPA is screening these data to determine whether any of these wastes are generated from similar industries or similar processing steps or have similar waste characteristics as those expected for ash generated from the incineration of K028 nonwastewaters. The Agency is reserving treatment standards for metal constituents in K028 nonwastewaters at this time. The Agency may modify the proposed metals standards at a later date.

For the proposed rule, the Agency transferred treatment performance data for lime and flyash stabilization of ash from the incineration of K048 and K051 at Plant C to K028 for the development of BDAT treatment standards for metals in ash. These data are included in Table 4-5.

Lime and Sulfide Precipitation and Vacuum Filtration. EPA's database for chemical precipitation in wastewaters is included in the California List Notice of Data Availability (52 Federal Register 29992, August 12, 1987) (Reference 15). Data are available for chemical precipitation and vacuum filtration of K062 mixed with metal-bearing characteristic wastes. Data are also available for chromium reduction followed by lime and sulfide precipitation and vacuum filtration for K062 mixed with metal-bearing characteristic wastes; however, since K028, K029, K095, and K096 do not contain hexavalent chromium, these data were not considered. EPA screened these data to determine whether any wastes are generated from similar industries or similar processing

steps, or have similar waste characteristics as those expected for scrubber water generated from the incineration of K028. Based on the K028 waste characterization data included in Section 2.0, the constituents of concern are cadmium, chromium, lead, and nickel. The K062 mixed with metal-bearing characteristic wastes treated at Plant D and the K028 scrubber water are both wastewaters containing the constituents of concern at similar concentrations.

EPA then examined the relative treatability of K028 scrubber water, the mixture of K062 and metal-bearing characteristic wastes. As discussed in the Technology Treatment Background Document (Reference 17), waste characteristics that affect treatment performance for chemical precipitation include the concentrations and types of metals in the waste, the concentrations of dissolved solids in the waste, the oil and grease content of the waste, and whether the metals exist in the wastewater as a complex. As discussed above, both K028 and the K062 mixture are expected to contain the constituents of concern. EPA considers that K062 wastewaters are more difficult to treat than K028 wastewaters because higher concentrations of metals and dissolved solids are anticipated in K062 than in scrubber water from K028 incineration. These higher metals and dissolved solids concentrations would interfere more with the effectiveness of the precipitation reactions intended to remove the metals of concern. Suspended solids and complex metals are not considered to be significant parameters in either waste. Since K028 scrubber water is generated from incineration, oil and grease is also not considered to be significant. However, the K062 mixture contains oil and grease and may therefore be more difficult to treat than K028 scrubber water.

Based on these analyses, transfer of performance data from K062 mixed with metal-bearing characteristic wastes to K028 wastewaters is valid. Treatment performance data for lime and sulfide precipitation followed by filtration from K062 mixed with metal-bearing characteristic wastes are included in Table 4-6.

Table 4-1

WASTE CHARACTERIZATION DATA COLLECTED BY EPA FOR K019
AND OTHER WASTES TREATED BY ROTARY KILN INCINERATION AT PLANT A

| Detected BDAT List Constituents | Wastes fed to the Rotary Kiln* | | Wastes fed to the Secondary Combustor* | |
|---|---|---|---|---|
| | K019 (ppm) | RCRA Blend (ppm) | PCB Blend (ppm) | Mercaptan-Contaminated Waste (ppm) |
| **METALS** | | | | |
| 155. Arsenic | <0.2-1.2 | 94 | 7.4 | <0.02 |
| 156. Barium | <0.9-0.97 | 1.3 | <19 | 1.67 |
| 158. Cadmium | <0.3-0.63 | <0.3 | <33 | <0.003 |
| 159. Chromium | 1.8-5.3 | 40 | 23.7 | <0.009 |
| 160. Copper | <1.0-3.6 | 165 | 107 | 0.027 |
| 161. Lead | 2.1-3.5 | 27 | <7.3 | 0.0064 |
| 163. Nickel | 2.2-6.0 | 8.8 | 6.2 | 0.037 |
| 168. Zinc | 4.4-9.4 | 4,170 | 6810 | 0.071 |
| **INORGANICS** | | | | |
| 171. Sulfide | 790 | 830 | 16,000 | 17 |

* Six sample sets of K019 were collected; results are presented as ranges.
Only one sample of RCRA Blend, PCB Blend, and Mercaptan-Contaminated wastes were collected.
Source: Rollins Onsite Engineering Report (Reference 6).

Table 4-2

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
AND OTHER WASTES TREATED BY ROTARY KILN INCINERATION AT PLANT A

KILN ASH RESIDUAL

| BDAT List Constituent | DECTECTION LIMIT | SAMPLE SET #1 | SAMPLE SET #2 | SAMPLE SET #3 | SAMPLE SET #4 | SAMPLE SET #5 | SAMPLE SET #6 |
|---|---|---|---|---|---|---|---|
| | | Concentration in Kiln Ash - Total Concentration (mg/kg) | | | | | |
| **Semivolatiles:** | | | | | | | |
| 70. Bis(2-ethylhexyl)phthalate | 2 | ND | ND | ND | 12 | ND | ND |
| 72. Di-n-butyl phthalate | 2 | ND | ND | ND | 230 | ND | ND |
| **Metals:** | | | | | | | |
| 154. Antimony | 6.0 | 8.0 | 6.8 | 9.2 | ND | 9.1 | 9.6 |
| 155. Arsenic | 0.2 | 3.6 | 2.8 | 5.7 | 5.7 | 3.9 | 2.3 |
| 156. Barium | 0.9 | 26 | 23 | 54 | 8.4 | 21 | 11 |
| 158. Cadmium | 0.3 | 0.66 | 0.96 | 3.6 | ND | 1.2 | 2.2 |
| 159. Chromium | 0.9 | 44 | 60 | 202 | 28 | 125 | 141 |
| 160. Copper | 1.0 | 2370 | 3430 | 2290 | 1270 | 2780 | 2520 |
| 161. Lead | 0.2 | 120 | 42 | 118 | 25 | 86 | 34 |
| 163. Nickel | 2.0 | 66 | 89 | 169 | 69 | 166 | 288 |
| 165. Silver | 0.9 | 3.3 | 3.4 | 1.9 | 2.6 | 3.3 | 3.1 |
| 167. Vanadium | 2.0 | 4.1 | 4.8 | 6.0 | ND | 5.7 | 8.7 |
| 168. Zinc | 0.6 | 12 | 13 | 16 | 11 | 22 | 13 |
| **Inorganics:** | | | | | | | |
| 170. Fluoride | 2 | 38 | ND | 6.1 | 3.2 | 23 | 4.7 |
| 171. Sulfide | 50 | 68 | 5.1 | 64 | ND | 64 | 92 |

ND The compound was not detected at or above the detection limit. Detection limits are provided in Appendix D.

Source: Rollins Onsite Engineering Report (Reference 6).

Table 4-3

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
AND OTHER WASTES TREATED BY ROTARY KILN INCINERATION AT PLANT A

SCRUBBER WATER RESIDUAL

| BDAT List Constituent | DECTECTION LIMIT | SAMPLE SET #1 | SAMPLE SET #2 | SAMPLE SET #3 | SAMPLE SET #4 | SAMPLE SET #5 | SAMPLE SET #6 |
|---|---|---|---|---|---|---|---|
| | Concentration in Scrubber Water - Total Concentration (ug/l) | | | | | | |
| **Volatiles:** | | | | | | | |
| 21. Dichlorodifluoromethane | 2 | ND | ND | 4.3 | 14 | ND | ND |
| 43. Toluene | 2 | ND | 3.2 | 2.6 | 4.6 | ND | ND |
| **Semivolatiles:** | | | | | | | |
| 98. Di-n-butyl phthalate | 2 | ND | 6.3 | 4.6 | 4.2 | 2.7 | 2.5 |
| **Metals:** | | | | | | | |
| 154. Antimony | 240 | 410 | 390 | 410 | 400 | 350 | 320 |
| 155. Arsenic | 2 | 46 | 38 | 30 | 29 | 27 | 33 |
| 156. Barium | 9 | 480 | 500 | 530 | 550 | 600 | 570 |
| 157. Beryllium | 1 | ND | ND | ND | ND | 2 | ND |
| 158. Cadmium | 3 | 230 | 190 | 150 | 130 | 120 | 110 |
| 159. Chromium | 9 | 110 | 140 | 130 | 140 | 140 | 130 |
| 160. Copper | 10 | 1810 | 1380 | 1180 | 1130 | 1030 | 870 |
| 161. Lead | 80 | 820 | 780 | 640 | 600 | 480 | 400 |
| 162. Mercury | 0.2 | 2 | 2.6 | 1.5 | 0.4 | 1 | 1 |
| 163. Nickel | 20 | 81 | 68 | 57 | 65 | 67 | 61 |
| 165. Silver | 9 | 85 | 95 | 92 | 92 | 90 | 92 |
| 167. Vanadium | 20 | 160 | 180 | 150 | 150 | 160 | 160 |
| 168. Zinc | 6 | 11,400 | 11,000 | 9500 | 9980 | 11,100 | 10,400 |
| **Inorganics:** | | | | | | | |
| 170. Fluoride | 10 | 20,000 | 15,000 | 14,000 | 13,000 | 12,000 | 12,000 |

ND The compound was not detected at or above the detection limit. Detection limits are provided in Appendix D.

Source: Rollins Onsite Engineering Report (Reference 6).

Table 4-4

DESIGN AND OPERATING DATA FOR THE ROTARY KILN AND SECONDARY COMBUSTOR AT PLANT A

| Parameter (units) | Design Value | SAMPLE SET #1 | SAMPLE SET #2 | SAMPLE SET #3 | SAMPLE SET #4 | SAMPLE SET #5 | SAMPLE SET #6 |
|---|---|---|---|---|---|---|---|
| Kiln Outlet Temperature (°F) | • | 1825-1900 | 1800-1880 | 1850-1900 | 1775-1900 | 1775-1800 | 1775-1850 |
| Kiln Solids Residence Time (min) | • | 120 | 120 | 120 | 120 | 120 | 120 |
| Kiln Waste Feed Rate (MMBTU/hr) | • | | | | | | |
| K019: | | 13.1 | 12.2 | 12.4 | 12.7 | 11.7 | 11.5 |
| RCRA Blend, Burner #1: | | 3.9-5.5 | 5.2-5.5 | 5.2-5.8 | 5.2-5.8 | 5.2-6.0 | 5.2-5.8 |
| RCRA Blend, Burner #2: | | 4.4-9.7 | 4.4-9.7 | 4.4-8.4 | 4.4-7.3 | 5.2-9.7 | 5.2-9.7 |
| | Total: | 21.4-28.3 | 21.8-27.4 | 22.0-26.6 | 22.3-25.8 | 22.1-27.4 | 21.9-27 |
| Kiln Rotational Speed (RPM) | • | 0.19-0.21 | 0.19-0.21 | 0.19-0.21 | 0.19-0.21 | 0.19-0.21 | 0.19-0.21 |
| Afterburner Temperature (°F) | • | 2380 | 2400 | 2400 | 2400 | 2400 | 2350 |
| Afterburner Residence Time (sec) | • | 2 | 2 | 2 | 2 | 2 | 2 |
| Afterburner Waste Feed Rate (MMBTU/hr) | • | | | | | | |
| PCB Blend: | | 36.1 | 36.5 | 36.5 | 36.5 | 37.5 | 37.5 |
| Mercaptan-Contaminated Waste: | | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 |
| | Total: | 36.28 | 36.68 | 36.68 | 36.68 | 37.68 | 37.68 |
| Stack Oxygen Concentration (%) | NA | 6.8 | 7.0 | 7.2 | 6.4 | 6.8 | 7.0 |
| Stack Carbon Monoxide Concentration (ppm volume) | NA | NR | NR | 0 | 0 | NR | NR |

• This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Source: Rollins Onsite Engineering Report (Reference 6).

NA - Not applicable.
NR - Not recorded.

Table 4-5

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K048 AND K051
PLANT C - LIME AND FLY ASH STABILIZATION OF INCINERATOR ASH

| Detected BDAT List Metal Constituent | Untreated Waste Concentration in TCLP Extract of K048 and K051 Incinerator Ash | Treated Waste Concentration in TCLP Extract of Stabilized Fluidized Bed Incinerator Ash Lime and Fly Ash Binder Run 1 mg/L (ppm) | Run 2 mg/L (ppm) | Run 3 mg/L (ppm) |
|---|---|---|---|---|
| 154. Antimony | 0.06-0.09 | <0.163 | <0.163 | <0.163 |
| 155. Arsenic | 0.008-0.025 | <0.004 | <0.004 | 0.006 |
| 156. Barium | 0.17-0.25 | 0.558 | 0.524 | 0.599 |
| 158. Cadmium | <0.003 | <0.003 | <0.003 | <0.003 |
| 159. Chromium (total) | 2.1-2.6 | 1.13 | 1.21 | 1.08 |
| 160. Copper | 0.02 | <0.003 | <0.003 | 0.006 |
| 161. Lead | <0.05 | <0.006 | <0.006 | <0.006 |
| 162. Mercury | 0.0002-0.0003 | NA | NA | NA |
| 163. Nickel | 0.02-0.03 | <0.018 | <0.018 | <0.018 |
| 167. Vanadium | 2.5-3.6 | 0.148 | 0.149 | 0.156 |
| 168. Zinc | 0.055-0.11 | 0.02 | 0.022 | 0.052 |

| Design and Operating Parameters | Stabilization Process Lime and Fly Ash Binder Run 1 | Run 2 | Run 3 |
|---|---|---|---|
| Binder to Ash Ratio | NP | NP | NP |
| Lime to Ash Ratio | 0.2 | 0.2 | 0.2 |
| Fly Ash to Ash Ratio | 0.2 | 0.2 | 0.2 |
| Water to Ash Ratio | 0.5 | 0.5 | 0.5 |
| Ambient Temperature (°C) | 19 | 19 | 19 |
| Mixture pH | 12.0 | 12.1 | 12.1 |
| Cure Time (days) | 28 | 28 | 28 |
| Unconfined Compressive Strength | 565.8 | 512.6 | 578.8 |

NA - Not analyzed.
NP - Not applicable.

Source: Waterways Onsite Engineering Report (Reference 7).

Table 4-6

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K062 MIXTURE, AT PLANT D
LIME AND SULFIDE PRECIPITATION FOLLOWED BY VACUUM FILTRATION*

| BDAT LIST METAL CONSTITUENT | Sample Set #8 | | Sample Set #11 | | Sample Set #12 | |
|---|---|---|---|---|---|---|
| | Concentration in Untreated K062 Mixture (ppm) | Concentration in Treated K062 Mixture Wastewater (ppm) | Concentration in Untreated K062 Mixture (ppm) | Concentration in Treated K062 Mixture Wastewater (ppm) | Concentration in Untreated K062 Mixture (ppm) | Concentration in Treated K062 Mixture Wastewater (ppm) |
| 154. Antimony | <10 | <1 | <10 | <1 | <10 | <1.00 |
| 155. Arsenic | <1 | <0.1 | <1 | <0.1 | <1 | <0.10 |
| 156. Barium | <10 | <1 | <10 | <1 | 12 | <1.00 |
| 157. Beryllium | <2 | <0.2 | <2 | <0.2 | <2 | <0.20 |
| 158. Cadmium | <5 | <0.5 | <5 | <0.5 | 23 | <5 |
| 221. Chromium (hexavalent) | 0.13 | <0.01 | 0.08 | 0.106 | 0.30 | <0.01 |
| 159. Chromium (total) | 831 | 0.15 | 395 | 0.12 | 617 | 0.18 |
| 160. Copper | 217 | 0.16 | 191 | 0.14 | 137 | 0.24 |
| 161. Lead | 212 | <0.01 | <10 | <0.01 | 136 | <0.01 |
| 162. Mercury | <1 | <0.1 | <1 | <0.1 | <1 | <0.10 |
| 163. Nickel | 669 | 0.36 | 712 | 0.33 | 382 | 0.39 |
| 164. Selenium | <10 | <1 | <10 | <1 | <10 | <1.00 |
| 165. Silver | <2 | <0.2 | <2 | <0.2 | <2 | <0.20 |
| 166. Thallium | <10 | <1 | <10 | <1 | <10 | <1.00 |
| 168. Zinc | 151 | 0.130 | 5 | 0.070 | 135 | 0.100 |

*Only 3 of the 12 data sets analyzed at Plant D represented treatment by this treatment train. Other data sets included pretreatment technologies such as chromium reduction and treatment for cyanide. These data are not included for reasons discussed in Section 4.2.

Source: Envirite Onsite Engineering Report, Tables 6-1 to 6-12 (Reference 8).

# 5.0 IDENTIFICATION OF BEST DEMONSTRATED AND AVAILABLE TECHNOLOGY (BDAT)

This section presents the Agency's rationale for determining the best demonstrated available technology (BDAT) for K028, K029, K095, and K096 nonwastewaters and K028 wastewaters. BDAT for K028 nonwastewaters and wastewaters has been determined to be rotary kiln incineration followed by stabilization of incinerator ash, and lime and sulfide precipitation and vacuum filtration of scrubber water. BDAT for K029, K095, and K096 nonwastewaters has been determined to be rotary kiln incineration.

As discussed in Section 3.0, the Agency has identified incineration as a demonstrated technology for treatment of organic constituents on K028, K029, K095, and K096. Stabilization and chemical precipitation and filtration are demonstrated technologies for treatment of metal constituents in K028 nonwastewaters and wastewaters, respectively. Total recycle and reuse is also demonstrated for K095 and K096 nonwastewaters. In the absence of treatment performance data for K028, K029, K095, and K096, treatment performance data from similar wastes were transferred to these wastes, as discussed in Section 4.0.

For a treatment technology to be identified as BDAT, the treatment performance data are first screened to determine whether they represent operation of a well-designed and well-operated treatment system, whether sufficient analytical quality assurance/quality control measures were employed to ensure the accuracy of the data, and whether the appropriate measures of

performance were used to assess the performance of the particular treatment technology.

The treatment performance data and the design and operating data collected during the test of rotary kiln incineration of K019 at plant A, stabilization of K048/K051 incinerator ash at plant C, and chemical precipitation followed by vacuum filtration at plant D were reviewed for the points described above. The appropriate measures of performance (total constituent concentration for incineration and chemical precipitation, and TCLP for stabilization) were used to assess the treatment systems. Additionally, the Agency had no reason to believe that the treatment systems at plants A, C, and D were not well-designed and well-operated, or that insufficient analytical quality assurance/quality control measures were employed in generating treatment performance data.

An available treatment technology is one that (1) is not a proprietary or patented process that cannot be purchased or licensed from the proprietor (i.e., it must be commercially available), and (2) substantially diminishes the toxicity of the waste or substantially reduces the likelihood of migration of hazardous constituents from the waste. The demonstrated technologies for treatment of these wastes--incineration (rotary kiln and fluidized bed incineration), stabilization, chemical precipitation followed by vacuum filtration, and total recycle and reuse--are considered to be commercially available.

In cases where the Agency has treatment performance data for a waste for more than one treatment technology, EPA uses the statistical method known as the analysis of variance (ANOVA) test to determine if one technology performs significantly better than the others. (The ANOVA test is discussed in EPA's Methodology for Developing BDAT Treatment Standards (Reference 16).) For K028, K029, K095, and K096, the Agency has treatment performance data for only one treatment system; therefore, an ANOVA comparison is not appropriate.

## 6.0 SELECTION OF REGULATED CONSTITUENTS

This section presents the methodology and rationale for selection of regulated constituents in K028, K029, K095, and K096 nonwastewaters and K028 wastewaters. Generally, regulated constituents must satisfy the following criteria:

1. They must be on the BDAT List of constituents. (Presence on the BDAT List means that approved methods exist for analyzing the constituent in treated waste matrices.)

2. They must be present in or be suspected of being present in the untreated waste. For example, analytical difficulties may prevent a constituent from being identified in the untreated waste, but its identification in a treatment residual may lead the Agency to conclude that it is present in the untreated waste.

3. Where treatment performance data are transferred, the regulated constituents must be no more difficult to treat than the constituents from which performance data are transferred. Factors used to assess ease of treatment vary according to the technology of concern. For example, for incineration, the factors include bond dissociation energy and boiling point.

The Agency initially considered all constituents on the BDAT List for regulation. Table 6-1, at the end of this section, summarizes available waste characterization data for K028, K029, K095, and K096 for the BDAT List constituents (as derived from Tables 2-1 through 2-4). Ranges of concentrations for constituents detected in the wastes are shown in the table. If an analysis for a constituent was performed but the constituent was not detected in the waste, the table indicates "ND" for that constituent. Constituents for which no analysis was performed are identified by "NA" (not analyzed). As discussed further below, a BDAT List constituent was deleted from

consideration for regulation if: (1) the constituent was not detected in the untreated waste and is not suspected of being present in the waste; (2) the constituent was not analyzed for in the untreated waste; (3) detection limits or analytical results were not obtained for the constituent due to analytical problems; (4) available treatment performance data for the constituent did not show effective treatment by BDAT; or (5) other reasons as discussed in Section 6.1.

The Agency is currently evaluating treatment performance data for stabilization of ash from the incineration of F024. Treatment standards for metals in K028 nonwastewaters are reserved until the Agency has completed its evaluation of the data. The Agency may reevaluate the selection of metal constituents for regulation in K028 nonwastewaters based on these data.

## 6.1 BDAT List Constituents Not Selected for Regulation

BDAT List Constituents That Were Not Detected in the Untreated Waste. BDAT List constituents that were not detected in the untreated wastes (labeled "ND" in Table 6-1) were deleted from consideration for regulation. Since detection limits vary according to the nature of the waste matrix being analyzed, the detection limits determined in the characterization of K028, K029, K095, and K096, if available, are included in Appendix D.

BDAT List Constituents That Were Not Analyzed for in the Untreated Waste. Some constituents on the BDAT List were deleted from consideration for

regulation because these constituents were not analyzed for in the untreated waste (labeled "NA" in Table 6-1). Some constituents such as organochlorine pesticides, phenoxyacetic acid herbicides, organophosphorus insecticides, PCBs, and dioxins and furans were not analyzed for in the untreated waste because it was extremely unlikely that these constituents would be present in the waste.

Constituents for Which Analytical Results Were Not Obtained Due to Analytical Problems Resulting from the Nature of Waste. Hexavalent chromium is not being regulated in K028 nonwastewaters and wastewaters because of an analytical problem (labeled "A" in Table 6-1). The analysis for total constituent concentration of hexavalent chromium could not be performed due to the oily nature of the K028 sample. However, total chromium was analyzed for in the K028 sample, and the result of the total chromium analysis includes the concentration of hexavalent chromium present in the sample, if any. Total chromium is being regulated in K028 nonwastewaters and wastewaters. Hexavalent chromium was analyzed for but was not detected in the TCLP extract of the K028 sample.

Constituents for Which Available Treatment Performance Data Did Not Show Effective Treatment by BDAT. BDAT List constituents that were present in untreated K028, K029, K095, and K096 but were not effectively treated by BDAT were deleted from consideration for regulation. Accordingly, barium, which was detected in untreated K028, is not being regulated in K028 wastewaters and nonwastewaters because available treatment performance data for the BDAT

treatment technologies for K028 did not represent effective treatment of this constituent. In addition, cadmium and lead were deleted from consideration for regulation in nonwastewaters because the Agency's data on stabilization of fluidized bed incinerator ash from incineration of K048 and K051 did not show effective treatment for these constituents.

Constituents Deleted From Consideration for Regulation for Other Reasons. Copper, vanadium, and zinc were considered for regulation in K028 wastewaters and nonwastewaters but were not selected as regulated constituents. Although copper cyanide, vanadium pentoxide, and zinc cyanide are listed in Appendix VIII of 40 CFR Part 261, the metals are not listed individually. In this rulemaking, the Agency is only regulating copper, vanadium, and/or zinc when they are indicators of performance of treatment for Appendix VIII constituents. For K028 nonwastewaters and wastewaters, copper, vanadium, and zinc have not been identified as indicators of treatment performance for other Appendix VIII constituents and are therefore not being regulated.

## 6.2 BDAT List Constituents Selected for Regulation

All of the organic and metal constituents that were further considered for regulation in K028, K029, K095, and K096 nonwastewaters and K028 wastewaters have been selected for regulation. However, as discussed previously, the Agency may reevaluate the selection of metal constituents for

regulation in K028 nonwastewaters. The regulated constituents are presented in Tables 6-2, 6-3, 6-4, and 6-5 for K028, K029, K095, and K096, respectively.

Table 6-1

STATUS OF BDAT LIST CONSTITUENTS IN UNTREATED K028, K029, K095, AND K096

| BDAT List Constituent | Detection Status: Concentration in Untreated Waste (mg/kg) | | | |
|---|---|---|---|---|
| **Volatiles** | **K028** | **K029** | **K095** | **K096** |
| 222. Acetone | ND | NA | ND | ND |
| 1. Acetonitrile | ND | NA | NA | NA |
| 2. Acrolein | ND | NA | ND | ND |
| 3. Acrylonitrile | ND | NA | NA | NA |
| 4. Benzene | ND | NA | ND | ND |
| 5. Bromodichloromethane | ND | NA | ND | ND |
| 6. Bromomethane | ND | NA | NA | NA |
| 223. n-Butyl alcohol | NA | NA | NA | NA |
| 7. Carbon tetrachloride | ND | NA | ND | ND |
| 8. Carbon disulfide | ND | NA | NA | NA |
| 9. Chlorobenzene | ND | NA | NA | NA |
| 10. 2-Chloro-1,3-butadiene | ND | NA | NA | NA |
| 11. Chlorodibromomethane | ND | NA | NA | NA |
| 12. Chloroethane | ND | NA | ND | ND |
| 13. 2-Chloroethyl vinyl ether | ND | NA | ND | ND |
| 14. Chloroform | ND | EP | ND | ND |
| 15. Chloromethane | ND | NA | ND | ND |
| 16. 3-Chloropropene | ND | NA | ND | ND |
| 17. 1,2-Dibromo-3-chloropropane | ND | NA | NA | NA |
| 18. 1,2-Dibromoethane | ND | NA | NA | NA |
| 19. Dibromomethane | ND | NA | NA | NA |
| 20. trans-1,4-Dichloro-2-butene | ND | NA | ND | ND |
| 21. Dichlorodifluoromethane | ND | NA | ND | ND |
| 22. 1,1-Dichloroethane | 16,000-1,082,000* | NA | ND | ND |
| 23. 1,2-Dichloroethane | ND | 170,000 | ND | ND |
| 24. 1,1-Dichloroethylene | ND | EP | ND | ND |
| 25. trans-1,2-Dichloroethene | ND-1,700 | NA | ND | ND |
| 26. 1,2-Dichloropropane | ND | NA | ND | ND |

NA - Not analyzed.
ND - Not detected.
EP - Not analyzed but expected to be present in the waste.
* - Although quantitated at 108%, this concentration is estimated to range from 75-100% based on discussions with laboratory personnel. Variability in this concentration is due to the quantity of this constituent in the sample and the dilution factor of 10,000,000 used to analyze this constituent within the calibration range of the instrument.

Table 6-1 (Continued)

STATUS OF BDAT LIST CONSTITUENTS IN UNTREATED K028, K029, K095, AND K096

| BDAT List Constituent | Detection Status: Concentration in Untreated Waste (mg/kg) | | | |
|---|---|---|---|---|
| Volatiles (Continued) | K028 | K029 | K095 | K096 |
| 27. trans-1,3-Dichloropropene | ND | NA | ND | ND |
| 28. cis-1,3-Dichloropropene | ND | NA | ND | ND |
| 29. 1,4-Dioxane | ND | NA | NA | NA |
| 224. 2-Ethoxyethanol | NA | NA | NA | NA |
| 225. Ethyl acetate | NA | NA | NA | NA |
| 226. Ethyl benzene | ND | NA | ND | ND |
| 30. Ethyl cyanide | ND | NA | NA | NA |
| 227. Ethyl ether | NA | NA | NA | NA |
| 31. Ethyl methacrylate | ND | NA | NA | NA |
| 214. Ethylene oxide | ND | NA | NA | NA |
| 32. Iodomethane | ND | NA | NA | NA |
| 33. Isobutyl alcohol | ND | NA | NA | NA |
| 37. Methacrylonitrile | ND | NA | NA | NA |
| 228. Methanol | NA | NA | NA | NA |
| 34. Methyl ethyl ketone | ND | NA | ND | ND |
| 229. Methyl isobutyl ketone | ND | NA | ND | ND |
| 35. Methyl methacrylate | ND | NA | NA | NA |
| 38. Methylene chloride | ND | NA | ND | ND |
| 230. 2-Nitropropane | NA | NA | NA | NA |
| 39. Pyridine | ND | NA | NA | NA |
| 40. 1,1,1,2-Tetrachloroethane | ND-200,000 | NA | • | • |
| 41. 1,1,2,2-Tetrachloroethane | ND-53,000 | NA | • | • |
| 42. Tetrachloroethene | ND-6,500 | NA | • | • |
| 43. Toluene | ND | NA | ND | ND |
| 44. Tribromomethane | ND | NA | NA | NA |
| 45. 1,1,1-Trichloroethane | ND-1,900 | 830,000 | ND | ND |
| 46. 1,1,2-Trichloroethane | ND-300,000 | NA | • | • |
| 47. Trichloroethene | ND | NA | • | • |

NA - Not analyzed.
ND - Not detected.

• This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 6-1 (Continued)

STATUS OF BDAT LIST CONSTITUENTS IN UNTREATED K028, K029, K095, AND K096

| BDAT List Constituent | Detection Status: Concentration in Untreated Waste (mg/kg) | | | |
|---|---|---|---|---|
| | K028 | K029 | K095 | K096 |
| **Volatiles (Continued)** | | | | |
| 48. Trichloromonofluoromethane | ND | NA | ND | ND |
| 49. 1,2,3-Trichloropropane | ND | NA | ND | ND |
| 231. 1,1,2-Trichloro-1,2,2-trifluoroethane | NA | NA | ND | ND |
| 50. Vinyl chloride | ND | EP | ND | ND |
| 215. 1,2-Xylene | ND | NA | ND | ND |
| 216. 1,3-Xylene | ND | NA | ND | ND |
| 217. 1,4-Xylene | ND | NA | ND | ND |
| **Semivolatiles** | | | | |
| 51. Acenaphthalene | ND | NA | NA | NA |
| 52. Acenaphthene | ND | NA | NA | NA |
| 53. Acetophenone | ND | NA | NA | NA |
| 54. 2-Acetylaminofluorene | ND | NA | NA | NA |
| 55. 4-Aminobiphenyl | ND | NA | NA | NA |
| 56. Aniline | ND | NA | NA | NA |
| 57. Anthracene | ND | NA | NA | NA |
| 58. Aramite | ND | NA | NA | NA |
| 59. Benz(a)anthracene | ND | NA | NA | NA |
| 218. Benzal chloride | NA | NA | NA | NA |
| 60. Benzenethiol | ND | NA | NA | NA |
| 62. Benzo(a)pyrene | ND | NA | NA | NA |
| 63. Benzo(b)fluoranthene | ND | NA | NA | NA |
| 64. Benzo(ghi)perylene | ND | NA | NA | NA |
| 65. Benzo(k)fluoranthene | ND | NA | NA | NA |
| 66. p-Benzoquinone | ND | NA | NA | NA |
| 67. Bis(2-chloroethoxy)methane | ND | NA | ND | ND |
| 68. Bis(2-chloroethyl)ether | ND | NA | ND | ND |
| 69. Bis(2-chloroisopropyl)ether | ND | NA | ND | ND |
| 70. Bis(2-ethylhexyl)phthalate | ND | NA | NA | NA |
| 71. 4-Bromophenyl phenyl ether | ND | NA | ND | ND |
| 72. Butyl benzyl phthalate | ND | NA | NA | NA |
| 73. 2-sec-Butyl-4,6-dinitrophenol | ND | NA | NA | NA |

EP - Expected to be present in the waste.
NA - Not analyzed.
ND - Not detected.

Table 6-1 (Continued)

STATUS OF BDAT LIST CONSTITUENTS IN UNTREATED K028, K029, K095, AND K096

| BDAT List Constituent | Detection Status Concentration in Untreated Waste (mg/kg) | | | |
|---|---|---|---|---|
| Semivolatiles (Continued) | K028 | K029 | K095 | K096 |
| 74. p-Chloroaniline | ND | NA | NA | NA |
| 75. Chlorobenzilate | ND | NA | NA | NA |
| 76. p-Chloro-m-cresol | ND | NA | ND | ND |
| 77. 2-Chloronaphthalene | ND | NA | ND | ND |
| 78. 2-Chlorophenol | ND | NA | ND | ND |
| 79. 3-Chloropropionitrile | ND | NA | NA | NA |
| 80. Chrysene | ND | NA | NA | NA |
| 81. ortho-Cresol | ND | NA | NA | NA |
| 82. para-Cresol | ND | NA | NA | NA |
| 232. Cyclohexanone | NA | NA | NA | NA |
| 83. Dibenz(a,h)anthracene | ND | NA | NA | NA |
| 84. Dibenzo(a,e)pyrene | ND | NA | NA | NA |
| 85. Dibenzo(a,i)pyrene | ND | NA | NA | NA |
| 86. m-Dichlorobenzene | ND | NA | ND | • |
| 87. o-Dichlorobenzene | ND | NA | ND | ND |
| 88. p-Dichlorobenzene | ND | NA | ND | ND |
| 89. 3,3'-Dichlorobenzidine | ND | NA | NA | NA |
| 90. 2,4-Dichlorophenol | ND | NA | ND | ND |
| 91. 2,6-Dichlorophenol | ND | NA | ND | ND |
| 92. Diethyl phthalate | ND | NA | NA | NA |
| 93. 3,3-Dimethoxybenzidine | ND | NA | NA | NA |
| 94. p-Dimethylaminoazobenzene | ND | NA | NA | NA |
| 95. 3,3'-Dimethylbenzidine | ND | NA | NA | NA |
| 96. 2,4-Dimethylphenol | ND | NA | NA | NA |
| 97. Dimethyl phthalate | ND | NA | NA | NA |
| 98. Di-n-butyl phthalate | ND | NA | NA | NA |
| 99. 1,4-Dinitrobenzene | ND | NA | NA | NA |
| 100. 4,6-Dinitro-o-cresol | ND | NA | NA | NA |
| 101. 2,4-Dinitrophenol | ND | NA | NA | NA |
| 102. 2,4-Dinitrotoluene | ND | NA | NA | NA |
| 103. 2,6-Dinitrotoluene | ND | NA | NA | NA |
| 104. Di-n-octyl phthalate | ND | NA | NA | NA |
| 105. Di-n-propylnitrosamine | ND | NA | NA | NA |

NA - Not analyzed.
ND - Not detected.

• This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 6-1 (Continued)

STATUS OF BDAT LIST CONSTITUENTS IN UNTREATED K028, K029, K095, AND K096

| BDAT List Constituent | Detection Status: Concentration in Untreated Waste (mg/kg) | | | |
|---|---|---|---|---|
| Semivolatiles (Continued) | K028 | K029 | K095 | K096 |
| 106. Diphenylamine | ND | NA | NA | NA |
| 219. Diphenylnitrosamine | ND | NA | NA | NA |
| 107. 1,2-diphenylhydrazine | ND | NA | NA | NA |
| 108. Fluoranthene | ND | NA | NA | NA |
| 109. Fluorene | ND | NA | NA | NA |
| 110. Hexachlorobenzene | ND | NA | ND | ND |
| 111. Hexachlorobutadiene | ND-170 | NA | ND | ND |
| 112. Hexachlorocyclopentadiene | ND | NA | ND | ND |
| 113. Hexachloroethane | ND-170 | NA | • | ND |
| 114. Hexachlorophene | ND | NA | NA | NA |
| 115. Hexachloropropene | ND | NA | NA | NA |
| 116. Indeno(1,2,3-cd)pyrene | ND | NA | NA | NA |
| 117. Isosafrole | ND | NA | NA | NA |
| 118. Methapyrilene | ND | NA | NA | NA |
| 119. 3-Methylcholanthrene | ND | NA | NA | NA |
| 120. 4,4'-Methylenebis (2-chloroaniline) | ND | NA | NA | NA |
| 36. Methyl methanesulfonate | ND | NA | NA | NA |
| 121. Naphthalene | ND | NA | NA | NA |
| 122. 1,4-Naphthoquinone | ND | NA | NA | NA |
| 123. 1-Naphthylamine | ND | NA | NA | NA |
| 124. 2-Naphthylamine | ND | NA | NA | NA |
| 125. p-Nitroaniline | ND | NA | NA | NA |
| 126. Nitrobenzene | ND | NA | NA | NA |
| 127. 4-Nitrophenol | ND | NA | NA | NA |
| 128. N-Nitrosodi-n-butylamine | ND | NA | NA | NA |
| 129. N-Nitrosodiethylamine | ND | NA | NA | NA |
| 130. N-Nitrosodimethylamine | ND | NA | NA | NA |
| 131. N-Nitrosomethylethylamine | ND | NA | NA | NA |
| 132. N-Nitrosomorpholine | ND | NA | NA | NA |
| 133. N-Nitrosopiperidine | ND | NA | NA | NA |
| 134. N-Nitrosopyrrolidine | ND | NA | NA | NA |
| 135. 5-Nitro-o-toluidine | ND | NA | NA | NA |
| 136. Pentachlorobenzene | ND | NA | ND | ND |

ND - Not detected.

• This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 6-1 (Continued)

STATUS OF BDAT LIST CONSTITUENTS IN UNTREATED K028, K029, K095, AND K096

| BDAT List Constituent | Detection Status Concentration in Untreated Waste (mg/kg) | | | |
|---|---|---|---|---|
| **Semivolatiles (Continued)** | K028 | K029 | K095 | K096 |
| 137. Pentachloroethane | ND-6,900 | NA | • | • |
| 138. Pentachloronitrobenzene | ND | NA | NA | NA |
| 139. Pentachlorophenol | ND | NA | ND | ND |
| 140. Phenacetin | ND | NA | NA | NA |
| 141. Phenanthrene | ND | NA | NA | NA |
| 142. Phenol | ND | NA | NA | NA |
| 220. Phthalic anhydride | NA | NA | NA | NA |
| 143. 2-Picoline | ND | NA | NA | NA |
| 144. Pronamide | ND | NA | NA | NA |
| 145. Pyrene | ND | NA | NA | NA |
| 146. Resorcinol | ND | NA | NA | NA |
| 147. Safrole | ND | NA | NA | NA |
| 148. 1,2,4,5-Tetrachlorobenzene | ND | NA | ND | ND |
| 149. 2,3,4,6-Tetrachlorophenol | ND | NA | ND | ND |
| 150. 1,2,4-Trichlorobenzene | ND | NA | ND | • |
| 151. 2,4,5-Trichlorophenol | ND | NA | ND | ND |
| 152. 2,4,6-Trichlorophenol | ND | NA | ND | ND |
| 153. Tris(2,3-dibromopropyl)phosphate | ND | NA | NA | NA |
| **Metals*** | | | | |
| 154. Antimony | ND | NA | NA | NA |
| 155. Arsenic | ND | NA | NA | NA |
| 156. Barium | 17 | NA | NA | NA |
| 157. Beryllium | ND | NA | NA | NA |
| 158. Cadmium | 0.6 | NA | NA | NA |
| 159. Chromium (total) | 109 | NA | NA | NA |
| 221. Chromium (hexavalent) | A | NA | NA | NA |
| 160. Copper | 132 | NA | NA | NA |
| 161. Lead | 42 | NA | NA | NA |
| 162. Mercury | ND | NA | NA | NA |
| 163. Nickel | 70 | NA | NA | NA |

*Only one sample analyzed for metals.
NA - Not analyzed.
ND - Not detected.
A - Analysis could not be performed due to the oily nature of the sample.

• This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 6-1 (Continued)

STATUS OF BDAT LIST CONSTITUENTS IN UNTREATED K028, K029, K095, AND K096

| BDAT List Constituent | Detection Status: Concentration in Untreated Waste (mg/kg) | | | |
|---|---|---|---|---|
| **Metals*** (Continued) | K028 | K029 | K095 | K096 |
| 164. Selenium | ND | NA | NA | NA |
| 165. Silver | ND | NA | NA | NA |
| 166. Thallium | ND | NA | NA | NA |
| 167. Vanadium | 1.3 | NA | NA | NA |
| 168. Zinc | 78 | NA | NA | NA |
| **Inorganics** | | | | |
| 169. Cyanide | ND | NA | NA | NA |
| 170. Fluoride | NA | NA | NA | NA |
| 171. Sulfide | ND | NA | NA | NA |
| **Organochlorine Pesticides** | | | | |
| 172. Aldrin | NA | NA | NA | NA |
| 173. alpha-BHC | NA | NA | NA | NA |
| 174. beta-BHC | NA | NA | NA | NA |
| 175. delta-BHC | NA | NA | NA | NA |
| 176. gamma-BHC | NA | NA | NA | NA |
| 177. Chlordane | NA | NA | NA | NA |
| 178. DDD | NA | NA | NA | NA |
| 179. DDE | NA | NA | NA | NA |
| 180. DDT | NA | NA | NA | NA |
| 181. Dieldrin | NA | NA | NA | NA |
| 182. Endosulfan I | NA | NA | NA | NA |
| 183. Endosulfan II | NA | NA | NA | NA |
| 184. Endrin | NA | NA | NA | NA |
| 185. Endrin aldehyde | NA | NA | NA | NA |
| 186. Heptachlor | NA | NA | NA | NA |
| 187. Heptachlor epoxide | NA | NA | NA | NA |
| 188. Isodrin | NA | NA | NA | NA |
| 189. Kepone | NA | NA | NA | NA |

*Only one sample was analyzed for metals.
NA - Not analyzed.
ND - Not detected.

Table 6-1 (Continued)

STATUS OF BDAT LIST CONSTITUENTS IN UNTREATED K028, K029, K095, AND K096

| BDAT List Constituent | Detection Status Concentration in Untreated Waste (mg/kg) | | | |
|---|---|---|---|---|
| Organochlorine Pesticides (Continued) | K028 | K029 | K095 | K096 |
| 190. Methoxychlor | NA | NA | NA | NA |
| 191. Toxaphene | NA | NA | NA | NA |
| **Phenoxyacetic Acid Herbicides** | | | | |
| 192. 2,4-Dichlorophenoxyacetic acid | NA | NA | NA | NA |
| 193. Silvex | NA | NA | NA | NA |
| 194. 2,4,5-T | NA | NA | NA | NA |
| **Organophosphorus Insecticides** | | | | |
| 195. Disulfoton | NA | NA | NA | NA |
| 196. Famphur | NA | NA | NA | NA |
| 197. Methyl parathion | NA | NA | NA | NA |
| 198. Parathion | NA | NA | NA | NA |
| 199. Phorate | NA | NA | NA | NA |
| **PCBs** | | | | |
| 200. Aroclor 1016 | NA | NA | NA | NA |
| 201. Aroclor 1221 | NA | NA | NA | NA |
| 202. Aroclor 1232 | NA | NA | NA | NA |
| 203. Aroclor 1242 | NA | NA | NA | NA |
| 204. Aroclor 1248 | NA | NA | NA | NA |
| 205. Aroclor 1254 | NA | NA | NA | NA |
| 206. Aroclor 1260 | NA | NA | NA | NA |
| **Dioxins and Furans** | | | | |
| 207. Hexachlorodibenzo-p-dioxins | NA | NA | NA | NA |
| 208. Hexachlorodibenzofuran | NA | NA | NA | NA |
| 209. Pentachlorodibenzo-p-dioxins | NA | NA | NA | NA |
| 210. Pentachlorodibenzofuran | NA | NA | NA | NA |
| 211. Tetrachlorodibenzo-p-dioxins | NA | NA | NA | NA |
| 212. Tetrachlorodibenzofuran | NA | NA | NA | NA |
| 213. 2,3,7,8-Tetrachlorodibenzo-p-dioxin | NA | NA | NA | NA |

NA - Not analyzed.

Table 6-2

BDAT LIST CONSTITIUENTS SELECTED FOR REGULATION IN K028
NONWASTEWATERS AND WASTEWATERS

| Nonwastewaters | Wastewaters |
|---|---|
| 22. 1,1-Dichloroethane | 22. 1,1-Dichloroethane |
| 25. Trans-1,2-Dichloroethene | 25. Trans-1,2-Dichloroethene |
| 40. 1,1,1,2-Tetrachloroethane | 40. 1,1,1,2-Tetrachloroethane |
| 41. 1,1,2,2-Tetrachloroethane | 41. 1,1,2,2-Tetrachloroethane |
| 42. Tetrachloroethene | 42. Tetrachloroethene |
| 45. 1,1,1-Trichloroethane | 45. 1,1,1-Trichloroethane |
| 46. 1,1,2-Trichloroethane | 46. 1,1,2-Trichloroethane |
| 111. Hexachlorobutadiene | 111. Hexachlorobutadiene |
| 113. Hexachloroethane | 113. Hexachloroethane |
| 137. Pentachloroethane | 137. Pentachloroethane |
| 159. Chromium (RESERVED) | 158. Cadmium |
| 163. Nickel (RESERVED) | 159. Chromium (total) |
| | 161. Lead |
| | 163. Nickel |

Table 6-3

BDAT LIST CONSTITUENTS SELECTED FOR REGULATION
IN K029 NONWASTEWATERS

Nonwastewaters

14. Chloroform
23. 1 ,2-Dichloroethane
24. 1,1-Dichloroethylene
45. 1,1,1-Trichloroethane
50. Vinyl chloride

Table 6-4

BDAT LIST CONSTITUENTS SELECTED FOR REGULATION
IN K095 NONWASTEWATERS

Nonwastewaters

40. 1,1,1,2-Tetrachloroethane
41. 1,1,2,2-Tetrachloroethane
42. Tetrachloroethene
46. 1,1,2-Trichloroethane
47. Trichloroethene
113. Hexachloroethane
137. Pentachloroethane

Table 6-5

BDAT LIST CONSTITUENTS SELECTED FOR REGULATION
IN K096 NONWASTEWATERS

Nonwastewaters

40. 1,1,1,2-Tetrachloroethane
41. 1,1,2,2-Tetrachloroethane
42. Tetrachloroethene
46. 1,1,2-Trichloroethane
47. Trichlorethene
86. 1,3-Dichlorobenzene
137. Pentachloroethane
150. 1,2,4-Trichlorobenzene

## 7.0 CALCULATION OF BDAT TREATMENT STANDARDS

The Agency bases numerical treatment standards for regulated constituents on the performance of well-designed and well-operated BDAT treatment systems. These standards must account for analytical limitations in available treatment performance data, and the data must be adjusted for variabilities related to treatment, sampling, and analytical techniques and procedures. The purpose of this section is to calculate treatment standards for K028, K029, K095, and K096 nonwastewaters and K028 wastewaters for the constituents selected for regulation in Section 6.0 using the available treatment performance data from the BDAT treatment technologies. Since treatment standards for metals in K028 nonwastewaters are reserved at this time, treatment standards for these constituents are not calculated in this section. A discussion of how treatment standards for K028, K029, K095, and K096 nonwastewaters and K028 wastewaters were calculated is included in this section.

BDAT treatment standards for K028 nonwastewaters and wastewaters are based on the demonstrated technologies of rotary kiln incineration or fluidized bed incineration followed by stabilization of the ash, and lime and sulfide precipitation followed by vacuum filtration of the scrubber water. BDAT treatment standards for K029, K095, and K096 nonwastewaters are based on the demonstrated technologies of rotary kiln or fluidized bed incineration.

Before treatment standards are calculated, the treatment performance data are corrected to account for analytical interferences associated with the

chemical matrices of the samples. A complete discussion of the accuracy correction of treatment data is provided in Appendix C. Appendix C also contains the matrix spike recoveries and accuracy correction factors used to correct the treatment performance data, as well as the corrected treatment performance data.

After treatment performance data are corrected for accuracy, the arithmetic average of the corrected data is calculated for each regulated constituent. In cases where the constituent is not detected above its detection limit, the detection limit is used to calculate the average constituent concentration in the treated waste. Tables 7-1 through 7-5 (following this section) present the averages of the corrected treatment performance data for each constituent regulated in K028, K029, K095, and K096 nonwastewaters and K028 wastewaters.

The next step in calculating treatment standards is to determine the variability factor (VF) for each regulated constituent. The variability factor accounts for the variability inherent in treatment system performance, treatment residual collection, and treatment sample analysis. (For more information on calculation of variability factors, see EPA's Methodology for Developing BDAT Treatment Standards (Reference 16).) Variability factors for the constituents regulated in K028, K029, K095, and K096 are shown in Tables 7-1 through 7-5.

Finally, the treatment standard is calculated for each regulated constituent by multiplying the average of the corrected treatment performance values by the variability factor for the constituent. Treatment standards for K028, K029, K095, and K096 are presented in Tables 7-1 through 7-5 and are discussed in greater detail in Sections 7.1 and 7.2.

## 7.1 Calculation of Treatment Standards for K028, K029, K095, and K096 Nonwastewaters

### 7.1.1 BDAT List Organics

Treatment performance data from rotary kiln incineration of K028, K029, K095, and K096 are not available. Therefore, the Agency is transferring performance data from treatment of K019 at Plant A to K028, K029, K095, and K096. The rationale for this transfer was presented in Section 4.0.

Incineration generally results in the generation of ash (a nonwastewater form of K028, F029, F095, and K096) and combustion gas scrubber water (a wastewater form of K028, K029, K095, and K096). The best measure of performance for a destruction technology, such as incineration, is the total amount of each constituent of concern remaining after treatment. Therefore, BDAT treatment standards for organic constituents in K028, K029, K095, and K096 nonwastewaters were calculated based on total constituent concentration data transferred from K019 incinerator ash.

Treatment standards for organic constituents in K028, K029, K095, and K096 nonwastewaters were calculated using six sets of data for rotary kiln incineration of K019. Tables 4-1 and 4-2 of Section 4.0 present the total concentration of each organic constituent detected in untreated K019 and the treated nonwastewater residual (ash). Treatment performance data for each constituent regulated in K028, K029, K095, and K096 were transferred from data for the same constituent in K019 if that constituent was detected in the untreated K019. For a constituent not detected in the untreated K019, a treatment standard was developed based on treatment performance data from another constituent that was detected in the untreated K019 that was tested.

The particular constituent from which data are transferred is determined based on the characteristics of the waste that affect treatment performance by incineration with respect to the nonwastewater residual (i.e., incinerator ash). In the rotary kiln, energy in the form of heat is transferred to the waste to volatilize the organic waste constituents. To determine whether one constituent is equally or more difficult to volatilize than another constituent, the Agency examines the boiling points of the constituents.

In general, the Agency believes that a constituent with a higher boiling point (bp) is more difficult to treat than a constituent with a lower boiling point. Therefore, treatment performance data were transferred to K028, K029, K095, and K096 nonwastewaters from constituents detected in untreated K019 that had equal or higher boiling points. Specific cases where

data were transferred from another constituent are summarized below and are noted in Tables 7-1 through 7-4 at the end of this section. Tables 7-1 through 7-4 also show the calculations of the treatment standards for each regulated constituent. Boiling points for these constituents are presented in Appendix B.

24. 1,1-Dichloroethylene. The treatment standard for 1,1-dichloroethylene (bp 31.7°C) in K029 is based on data transferred from treatment of 1,1-dichloroethane, (bp 57.15°C) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that 1,1-dichloroethylene can be treated to concentrations as low as or lower than 1,1-dichloroethane.

25. trans-1,2-Dichloroethene. The treatment standard for trans-1,2-dichloroethene (bp 47.2°C) in K028 is based on data transferred from treatment of 1,1-dichloroethane (bp 57.15°C) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that trans-1,2-dichloroethene can be treated to concentrations as low as or lower than 1,1-dichloroethane.

40. 1,1,1,2-Tetrachloroethane. The treatment standard for 1,1,1,2-tetrachloroethane (bp 146.5°C) in K028, K095, and K096 is based on data transferred from treatment of bis(2-chloroethyl)ether (bp 178°C) in K019. Based on the waste characteristics that affect treatment performance of rotary

kiln incineration, the Agency expects that 1,1,1,2-tetrachloroethane can be treated to concentrations as low as or lower than bis(2-chloroethyl)ether.

41. 1,1,2,2-Tetrachloroethane. The treatment standard for 1,1,2,2-tetrachloroethane (bp 146.75°C) in K028, K095, and K096 is based on data transferred from treatment of bis(2-chloroethyl)ether (bp 178°C) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that 1,1,2,2-tetrachloroethane can be treated to concentrations as low as or lower than bis(2-chloroethyl)ether.

46. 1,1,2-Trichloroethane. The treatment standard for 1,1,2-trichloroethane (bp 113.5°C) in K028, K095, and K096 is based on data transferred from treatment of tetrachloroethene (bp 121°C) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that 1,1,2-trichloroethane can be treated to concentrations as low as or lower than tetrachloroethene.

50. Vinyl Chloride. The treatment standard for vinyl chloride (bp -13.37°C) in K029 is based on data transferred from treatment of chloroform (bp 61.5°) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that vinyl chloride can be treated to concentrations as low as or lower than chloroform.

86. 1,3-Dichlorobenzene. The treatment standard for 1,3-dichlorobenzene in K096 is based on data transferred from treatment of

bis(2-chloroethyl)ether in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that 1,3-dichlorobenzene can be treated to concentrations as low as or lower than bis(2-chloroethyl)ether.

111. Hexachlorobutadiene. The treatment standard for hexachlorobutadiene (bp 215°C) in K028 is based on data transferred from treatment of naphthalene (bp 217.9°C) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that hexachlorobutadiene can be treated to concentrations as low as or lower than naphthalene.

137. Pentachloroethane. The treatment standard for pentachloroethane (bp 161.5°C) in K028, K095, and K096 is based on data transferred from treatment of bis(2-chloroethyl)ether (bp 178°C) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that pentachloroethane can be treated to concentrations as low as or lower than bis(2-chloroethyl)ether.

### 7.1.2 BDAT List Metals

The Agency does not have treatment performance data for metals in K028 nonwastewaters. For the proposed rule, BDAT treatment standards for metals in K028 nonwastewaters were developed based on treatment performance data transferred from stabilization of incinerator ash from fluidized bed

incineration of K028/K051. The rationale for this transfer was presented in Section 4.0. The Agency is currently reevaluating treatment standards for metals in K028 nonwastewaters, and is not promulgating standards at this time.

## 7.2 Calculation of Treatment Standards for K028 Wastewaters

### 7.2.1 BDAT List Organics

Treatment performance data for the wastewater residual, scrubber water, from rotary kiln incineration of K028 are not available. Therefore, the Agency is transferring data from treatment of K019 at Plant A to develop treatment standards for K028 wastewaters. The rationale for this transfer was presented in Section 4.0.

The best measure of performance for a destruction technology, such as incineration, is the total amount of each constituent of concern remaining after treatment. Therefore, BDAT treatment standards for organic constituents in K028 wastewaters were calculated based on total constituent concentration data from K019 scrubber water.

Treatment standards for K028 were calculated using six sets of data from rotary kiln incineration of K019. Tables 4-1 and 4-3 of Section 4.0 present the total concentrations of each organic constituent in the untreated K019 and the treated wastewater residual, respectively. Treatment performance data for each constituent regulated in K028 were transferred from data for the

same constituent in K019 if that constituent was detected in the untreated K019. For a constituent not detected in the untreated K019, a treatment standard was developed based on treatment performance data from another constituent that was detected in the untreated K019 that was tested. The particular constituent from which data are transferred is determined based on the characteristics of the waste that affect treatment performance of incineration with respect to the wastewater residual (i.e., scrubber water). In the secondary chamber (or afterburner), energy in the form of heat is added to destabilize chemical bonds to initiate the combustion reactions. To determine whether one constituent is equally or more difficult to destabilize than another constituent, the Agency examines the bond dissociation energies of the constituents.

In general, the Agency believes that a constituent with a higher bond dissociation energy (BDE) is more difficult to treat than a constituent with a lower BDE. Therefore, treatment performance data were transferred to K028 wastewaters from constituents detected in untreated K019 that had an equal or higher BDE. Specific cases where data were transferred from another constituent are summarized below and are noted on Table 7-5. Table 7-5 also shows the calculation of the treatment standards for each BDAT List organic constituent regulated in K028 wastewaters. Bond dissociation energies for these constituents are presented in Appendix B.

25. trans-1,2-Dichloroethene. The treatment standard for trans-1,2-dichloroethene (BDE 505 kcal/mol) in K028 is based on data transferred

from treatment of hexachloroethane (BDE 565 kcal/mol) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that trans-1,2-dichloroethene can be treated to concentrations as low as or lower than hexachloroethane.

40. 1,1,1,2-Tetrachloroethane. The treatment standard for 1,1,1,2-tetrachloroethane (BDE 605 kcal/mol) in K028 is based on data transferred from treatment of 1,1,1-trichloroethane (BDE 625 kcal/mol) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that 1,1,1,2-tetrachloroethane can be treated to concentrations as low as or lower than 1,1,1-trichloroethane.

41. 1,1,2,2-Tetrachloroethane. The treatment standard for 1,1,2,2-tetrachloroethane (BDE 605 kcal/mol) in K028 is based on data transferred from treatment of 1,1,1-trichloroethane (BDE 625 kcal/mol) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that 1,1,2,2-tetrachloroethane can be treated to concentrations as low as or lower than 1,1,1-trichloroethane.

46. 1,1,2-Trichloroethane. The treatment standard for 1,1,2-trichloroethane (BDE 625 kcal/mol) in K028 is based on data transferred from treatment of 1,1,1-trichloroethane (BDE 625 kcal/mol) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that 1,1,2-trichloroethane can be treated to concentrations as low as or lower than 1,1,1-trichloroethane.

111. Hexachlorobutadiene. The treatment standard for hexachlorobutadiene (BDE 855 kcal/mol) in K028 is based on data transferred from treatment of bis(2-chloroethyl)ether (BDE 1290 kcal/mol) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that hexachlorobutadiene can be treated to concentrations as low as or lower than bis(2-chloroethyl)ether.

137. Pentachloroethane. The treatment standard for pentachloroethane (BDE 585 kcal/mol) in K028 is based on data transferred from treatment of 1,1,1-trichloroethane (BDE 625 kcal/mol) in K019. Based on the waste characteristics that affect treatment performance of rotary kiln incineration, the Agency expects that pentachloroethane can be treated to concentrations as low as or lower than 1,1,1-trichloroethane.

### 7.2.2 BDAT List Metals

The Agency does not have treatment performance data for metals in K028 wastewaters. BDAT treatment standards for metals in K028 wastewaters were developed based on performance data transferred from treatment of K062 mixed with metal-bearing characteristic wastes using lime and sulfide precipitation followed by vacuum filtration. The rationale for this transfer was presented in Section 4.0.

Lime and sulfide precipitation followed by vacuum filtration is a removal technology for metals in wastewater. The best measure of performance

for a removal technology is the total amount of each constituent of concern remaining in the wastewater after treatment. Therefore, the BDAT treatment standards for metals in K028 wastewaters were calculated based on total constituent concentration data; these data were transferred from treatment of K062 mixed with metal-bearing characteristic wastes at Plant D.

Treatment standards for metal constituents in K028 wastewaters were calculated using three data sets for lime and sulfide precipitation followed by vacuum filtration of K062 mixed with metal-bearing characteristic wastes. Table 4-6 in Section 4.0 presents the total concentrations for metal constituents in the untreated and treated K062 mixed with metal-bearing characteristic wastes. Table 7-5 presents the accuracy-corrected data and treatment standard calculations for the regulated metal constituents in K028 wastewaters.

Table 7-1

CALCULATION OF TREATMENT STANDARDS FOR ORGANIC CONSTITUENTS IN K028 NONWASTEWATERS

| | Regulated BDAT List Constituent (SW-846 Method Number) | K019 Constituent From Which Treatment Data Were Transferred | Arithmetic Average of Corrected Treatment Performance Values (ppm) | Variability Factor (VF) | Treatment Standard (Average X VF) (ppm) |
|---|---|---|---|---|---|
| | Volatiles (8240) (Total Concentration)[1] | | | | |
| 22. | 1,1-Dichloroethane | 1,1-Dichloroethane | 2.13 | 2.8 | 6.0 |
| 25. | trans-1,2-Dichloroethene | 1,1-Dichloroethane | 2.13 | 2.8 | 6.0 |
| 40. | 1,1,1,2-Tetrachloroethane | Bis(2-chloroethyl)ether | 2.0 | 2.8 | 5.6 |
| 41. | 1,1,2,2-Tetrachloroethane | Bis(2-chloroethyl)ether | 2.0 | 2.8 | 5.6 |
| 42. | Tetrachloroethene | Tetrachloroethene | 2.13 | 2.8 | 6.0 |
| 45. | 1,1,1-Trichloroethane | 1,1,1-Trichloroethane | 2.13 | 2.8 | 6.0 |
| 46. | 1,1,2-Trichloroethane | Tetrachloroethene | 2.13 | 2.8 | 6.0 |
| | Semivolatiles (8270) (Total Concentration)[1] | | | | |
| 111. | Hexachlorobutadiene | Naphthalene | 2.0 | 2.8 | 5.6 |
| 113. | Hexachloroethane | Hexachloroethane | 10.0 | 2.8 | 28.0 |
| 137. | Pentachloroethane | Bis(2-chloroethyl)ether | 2.0 | 2.8 | 5.6 |

[1]For a detailed discussion of the analytical methods upon which these treatment standards are based, see the Rollins Onsite Engineering Report (Reference 6).

Table 7-2

CALCULATION OF TREATMENT STANDARDS FOR ORGANIC CONSTITUENTS IN K029 NONWASTEWATERS

| Regulated BDAT List Constituent (SW-846 Method Number) | K019 Constituent From Which Treatment Data Were Transferred | Arithmetic Average of Corrected Treatment Performance Values (ppm) | Variability Factor (VF) | Treatment Standard (Average X VF) (ppm) |
|---|---|---|---|---|
| Volatiles (8240) (Total Concentration)[1] | | | | |
| 14. Chloroform | Chloroform | 2.13 | 2.8 | 6.0 |
| 23. 1,2-Dichloroethane | 1,2-Dichloroethane | 2.13 | 2.8 | 6.0 |
| 24. 1,1-Dichloroethylene | 1,1-Dichloroethane | 2.13 | 2.8 | 6.0 |
| 45. 1,1,1-Trichloroethane | 1,1,1-Trichloroethane | 2.13 | 2.8 | 6.0 |
| 50. Vinyl Chloride | Chloroform | 2.13 | 2.8 | 6.0 |

[1]For a detailed discussion of the analytical methods upon which these treatment standards are based, see the [illegible] Engineering Report (Reference 6).

Table 7-3

CALCULATION OF TREATMENT STANDARDS FOR ORGANIC CONSTITUENTS IN K095 NONWASTEWATERS

| | Regulated BDAT List Constituent (SW-846 Method Number) | K019 Constituent From Which Treatment Data Were Transferred | Arithmetic Average of Corrected Treatment Performance Values (ppm) | Variability Factor (VF) | Treatment Standard (Average X VF) (ppm) |
|---|---|---|---|---|---|
| | Volatiles (8240) (Total Concentration)[1] | | | | |
| 40. | 1,1,1,2-Tetrachloroethane | Bis(2-chloroethyl)ether | 2.0 | 2.8 | 5.6 |
| 41. | 1,1,2,2-Tetrachloroethane | Bis(2-chloroethyl)ether | 2.0 | 2.8 | 5.6 |
| 42. | Tetrachloroethene | Tetrachloroethene | 2.13 | 2.8 | 6.0 |
| 46. | 1,1,2-Trichloroethane | Tetrachloroethene | 2.13 | 2.8 | 6.0 |
| 47. | Trichloroethene | Trichloroethene | 2.0 | 2.8 | 5.6 |
| | Semivolatiles (8270) (Total Concentration)[1] | | | | |
| 113. | Hexachloroethane | Hexachloroethane | 10.0 | 2.8 | 28.0 |
| 137. | Pentachloroethane | Bis(2-chloroethyl)ether | 2.0 | 2.8 | 5.6 |

[1]For a detailed discussion of the analytical methods upon which these treatment standards are based, see the Multiple Hearth Engineering Report (Reference 6).

Table 7-4

CALCULATION OF TREATMENT STANDARDS FOR ORGANIC CONSTITUENTS IN K096 NONWASTEWATERS

| Regulated BDAT List Constituent (SW-846 Method Number) | K019 Constituent From Which Treatment Data Were Transferred | Arithmetic Average of Corrected Treatment Performance Values (ppm) | Variability Factor (VF) | Treatment Standard (Average x VF) (ppm) |
|---|---|---|---|---|
| **Volatiles (8240) (Total Concentration)[1]** | | | | |
| 40. 1,1,1,2-Tetrachloroethane | Bis(2-chloroethyl)ether | 2.0 | 2.8 | 5.6 |
| 41. 1,1,2,2-Tetrachloroethane | Bis(2-chloroethyl)ether | 2.0 | 2.8 | 5.6 |
| 42. Tetrachloroethene | Tetrachloroethene | 2.13 | 2.8 | 6.0 |
| 46. 1,1,2-Trichloroethane | Tetrachloroethene | 2.13 | 2.8 | 6.0 |
| 47. Trichloroethene | Trichloroethene | 2.0 | 2.8 | 5.6 |
| **Semivolatiles (8270) (Total Concentration)[1]** | | | | |
| 86. 1,3-Dichlorobenzene | Bis(2-Chloroethyl)ether | 2.0 | 2.8 | 5.6 |
| 137. Pentachloroethane | Bis(2-Chloroethyl)ether | 2.0 | 2.8 | 5.6 |
| 150. 1,2,4-Trichlorobenzene | 1,2,4-Trichlorobenzene | 6.67 | 2.8 | 19.0 |

[1]For a detailed discussion of the analytical methods upon which these treatment standards are based, see the Kolleen Onsite Engineering Report (Reference 6).

Table 7-5

CALCULATION OF TREATMENT STANDARDS FOR ORGANIC AND METAL CONSTITUENTS IN K028 WASTEWATERS

| Regulated BDAT List Constituent (SW-846 Method Number) | K019 Constituent From Which Treatment Data Were Transferred | Arithmetic Average of Corrected Treatment Performance Values (ppm) | Variability Factor (VF) | Treatment Standard (Average x VF) (ppm) |
|---|---|---|---|---|
| **Volatiles (8240) (Total Concentration)[1]** | | | | |
| 22. 1,1-Dichloroethane | 1,1-Dichloroethane | 0.003 | 2.8 | 0.007 |
| 25. trans-1,2-Dichloroethene | Hexachloroethane | 0.012 | 2.8 | 0.033 |
| 40. 1,1,1,2-Tetrachloroethane | 1,1,1-Trichloroethane | 0.003 | 2.8 | 0.007 |
| 41. 1,1,2,2-Tetrachloroethane | 1,1,1-Trichloroethane | 0.003 | 2.8 | 0.007 |
| 42. Tetrachloroethene | Tetrachloroethene | 0.003 | 2.8 | 0.007 |
| 45. 1,1,1-Trichloroethane | 1,1,1-Trichloroethane | 0.003 | 2.8 | 0.007 |
| 46. 1,1,2-Trichloroethane | 1,1,1-Trichloroethane | | | |
| **Semivolatiles (8270) (Total Concentration)[1]** | | | | |
| 111. Hexachlorobutadiene | Bis(2-chloroethyl)ether | 0.002 | 2.8 | 0.007 |
| 113. Hexachloroethane | Hexachloroethane | 0.012 | 2.8 | 0.033 |
| 137. Pentachloroethane | 1,1,1-Trichloroethane | 0.003 | 2.8 | 0.007 |

[1]For a detailed discussion of the analytical methods upon which these treatment standards are based, see the Background Document for Final Treatment Rule Report (Reference 6).

Table 7-5 (Continued)

CALCULATION OF TREATMENT STANDARDS FOR ORGANIC AND METAL CONSTITUENTS IN K028 WASTEWATERS

| Regulated BDAT List Constituent | Arithmetic Average of Corrected Treatment Performance Values (ppm) | Variability Factor (VF) | Treatment Standard (Average X VF) (ppm) |
|---|---|---|---|
| **Metals (Total Concentration)[1]** | | | |
| 158. Cadmium | 2.29 | 2.8 | 6.4 |
| 159. Chromium (total) | 0.221 | 1.58 | 0.35 |
| 161. Lead | 0.0132 | 2.8 | 0.037 |
| 163. Nickel | 0.387 | 1.21 | 0.47 |

[1]For a detailed discussion of the analytical methods upon which these treatment standards are based, see the Treatment Onsite Engineering Report (Reference 8).

## 8.0 ACKNOWLEDGEMENTS

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# APPENDIX A

## SUMMARY OF PLANT CODES

Table A-1

SUMMARY OF PLANT CODES

| Plant Code | Plant Name | Data Source |
|---|---|---|
| A | Rollins Environmental Services<br>Deer Park, Texas | EPA Testing<br>(Reference 6) |
| B | Amoco Oil Company<br>Whiting, Indiana | EPA Testing<br>(Reference 18) |
| C | Waterways Experiment Station<br>Vicksburg, Mississippi | EPA Testing<br>(Reference 7) |
| D | Envirite Corporation<br>York, Pennsylvania | EPA Testing<br>(Reference 8) |
| E | DuPont Chemical Company<br>LaPlace, Louisiana | EPA Testing<br>(Reference 6) |
| F | Shell Chemicals<br>Norco, Louisiana | EPA Testing<br>(Reference 6) |
| G | Vista Chemicals<br>Lake Charles, Louisiana | EPA Testing<br>(Reference 6) |
| H | Vulcan Chemicals<br>Wichita, Kansas | EPA Testing<br>(Reference 6) |
| I | Environmental Services Corportion<br>El Dorado, Arkansas | EPA Testing<br>(Reference 21) |
| J | Envirite Corporation<br>York, Pennsylvania | EPA Testing<br>(Reference 22) |

# APPENDIX B

## WASTE CHARACTERISTICS AFFECTING PERFORMANCE


| | Table |
|---|---|
| List of boiling points for constituents of interest | B-1 |
| List of bond dissociation energies for constituents of interest | B-2 |

Table B-1

LIST OF BOILING POINTS FOR CONSTITUENTS OF INTEREST

| | Constituent* | Boiling Point (°C) |
|---|---|---|
| 7. | Carbon tetrachloride | 76.7 |
| 9. | Chlorobenzene | 131-132 |
| 14. | Chloroform | 61.5 |
| 22. | 1,1-Dichloroethane | 57.15 |
| 23. | 1,2-Dichloroethane | 83.5 |
| 25. | trans-1,2-Dichloroethene | 47.2 |
| 40. | 1,1,1,2-Tetrachloroethane | 146.5 |
| 41. | 1,1,2,2-Tetrachloroethane | 146.75 |
| 42. | Tetrachloroethene | 121 |
| 45. | 1,1,1-Trichloroethane | 74 |
| 46. | 1,1,2-Trichloroethane | 113.5 |
| 47. | Trichloroethene | 86.7 |
| 68. | Bis(2-chloroethyl)ether | 178 |
| 88. | p-Dichlorobenzene | 174 |
| 109. | Fluorene | 295 |
| 110. | Hexachlorobenzene | 324.5 |
| 111. | Hexachlorobutadiene | 215 |
| 113. | Hexachloroethane | 186.9 |
| 121. | Naphthalene | 217.9 |
| 136. | Pentachlorobenzene | 275-277 |
| 137. | Pentachloroethane | 161.5 |
| 141. | Phenanthrene | 246 |
| 148. | 1,2,4,5-Tetrachlorobenzene | 340 |
| 150. | 1,2,4,-Trichlorobenzene | 213 |

*Identified by BDAT List number.

Sources: Merck Index (Reference 10).
Handbook of Environmental Data on Organic Chemicals (Reference 11).

Table B-2

LIST OF BOND DISSOCIATION ENERGIES FOR CONSTITUENTS OF INTEREST

| | Constituents* | Bond Dissociation Energy (kcal/mole) |
|---|---|---|
| 7. | Carbon Tetrachloride | 380 |
| 9. | Chlorobenzene | 1320 |
| 14. | Chloroform | 340 |
| 22. | 1,1-Dichloroethane | 645 |
| 23. | 1,2-Dichloroethane | 645 |
| 25. | trans-1,2-Dichloroethene | 505 |
| 40. | 1,1,1,2-Tetrachloroethane | 605 |
| 41. | 1,1,2,2-Tetrachloroethane | 605 |
| 42. | Tetrachloroethene | 465 |
| 45. | 1,1,1-Trichloroethane | 625 |
| 46. | 1,1,2-Trichloroethane | 625 |
| 47. | Trichloroethene | 481 |
| 68. | Bis(2-chloroethyl)ether | 1290 |
| 88. | p-Dichlorobenzene | 1325 |
| 109. | Fluorene | 2740 |
| 110. | Hexachlorobenzene | 1305 |
| 111. | Hexachlorobutadiene | 855 |
| 113. | Hexachloroethane | 565 |
| 121. | Naphthalene | 2120 |
| 136. | Pentachlorobenzene | 1320 |
| 137. | Pentachloroethane | 585 |
| 141. | Phenanthrene | 2900 |
| 148. | 1,2,4,5-Tetrachlorobenzene | 1320 |
| 150. | 1,2,4-Trichlorobenzene | 1325 |

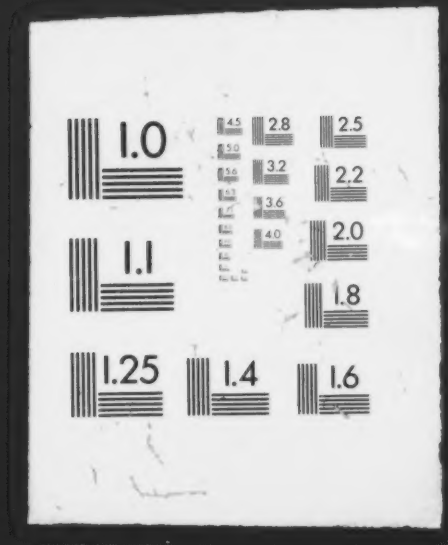
*Identified by BDAT List number.

Sources: Sanderson, R.T. Chemical Bonds and Bond Energy (Reference 13).
Lange's Handbook of Chemistry (Reference 14).
Handbook of Chemistry and Physics (Reference 12).

# APPENDIX C

## ACCURACY CORRECTION OF TREATMENT PERFORMANCE DATA

2 OF 2
PB 89
221 519



# APPENDIX C

## ACCURACY CORRECTION OF TREATMENT PERFORMANCE DATA

The treatment performance data used to determine treatment standards for K028, K029, K095, and K096 were adjusted to account for analytical interferences associated with the chemical matrices of the samples. Generally, treatment performance data were corrected for accuracy as follows: (1) a matrix spike recovery was determined for each BDAT List constituent detected in the untreated or treated waste; (2) an accuracy correction factor was determined for each of the above constituents by dividing 100 by the matrix spike recovery (percent) for that constituent; and (3) treatment performance data for each BDAT List constituent detected in the untreated or treated waste were corrected by multiplying the reported concentration of each constituent by its corresponding accuracy correction factor. The procedure for accuracy correction of the data is described in further detail below.

Matrix spike recoveries are developed by analyzing a sample of a treated waste for a constituent and then re-analyzing the sample after the addition of a known amount of the same constituent (i.e., spike) to the sample. The matrix spike recovery represents the total amount of constituent recovered after spiking, minus the initial concentration of the constituent in the sample, and the result divided by the spike concentration of the constituent.

Matrix spike recoveries used to adjust the treatment performance data transferred to K028, K029, K095, and K096 are shown in Tables C-1 through C-3. Duplicate matrix spikes were performed for some BDAT List constituents If a duplicate matrix spike was performed for a constituent, the matrix spike recovery used for that constituent was the lower of the two values from the first matrix spike and the duplicate spike.

Where a matrix spike was not performed for an organic constituent, the matrix spike recovery for that constituent was derived from the average matrix spike recoveries of the appropriate group of constituents (e.g., volatile or semivolatile organics) for which recovery data were available. In these cases, the matrix spike recoveries for all volatiles or semivolatiles from the first matrix spike were averaged. Similarly an average matrix spike recovery was calculated for the duplicate matrix spike recoveries. The lower of the two average matrix spike recoveries of the volatile or semivolatile group was used for any volatile or semivolatile constituent for which no matrix spike was performed.

The accuracy correction factors for the data used to calculate K028, K029, K095, and K096 treatment standards are presented in Tables C-4 and C-5. The corrected treatment concentrations for the constituents regulated in K028, K029, K095, and K096 nonwastewaters and K028 wastewaters are presented in Tables C-6 and C-7.

Table C-1

MATRIX SPIKE RECOVERIES FOR KILN ASH RESIDUE (K019)

| Spike Constituent | Original Amount Found (ppm) | Sample Result: Amount Spiked (ppm) | Sample Result: Amount Recovered (ppm) | Sample Result: Percent Recovery* (ppm) | Duplicate Sample Result: Amount Spiked (ppm) | Duplicate Sample Result: Amount Recovered (ppm) | Duplicate Sample Result: Percent Recovery* (ppm) |
|---|---|---|---|---|---|---|---|
| VOLATILES | | | | | | | |
| 4. Benzene | <0.002 | 0.025 | 0.0226 | 90 | 0.025 | 0.0212 | 85 |
| 9. Chlorobenzene | <0.002 | 0.025 | 0.0248 | 99 | 0.025 | 0.025 | 100 |
| 24. 1,1-Dichloroethene | <0.002 | 0.025 | 0.0212 | 85 | 0.025 | 0.0194 | 78 |
| 47. Trichloroethene | <0.002 | 0.025 | 0.0268 | 107 | 0.025 | 0.028 | 112 |
| AVERAGE RECOVERY FOR VOLATILES | | | | 95 | | | 94 |
| SEMIVOLATILES (BASE/NEUTRAL FRACTION) | | | | | | | |
| 52. Acenaphthene | <0.002 | 0.050 | 0.055 | 110 | 0.050 | 0.055 | 110 |
| 88. 1,4-Dichlorobenzene | <0.002 | 0.050 | 0.045 | 90 | 0.050 | 0.0495 | 99 |
| 102. 2,4-Dinitrotoluene | <0.05 | 0.050 | 0.0535 | 107 | 0.050 | 0.055 | 110 |
| 105. N-Nitroso-di-n-propylamine | <0.005 | 0.050 | 0.060 | 120 | 0.050 | 0.065 | 130 |
| 145. Pyrene | <0.002 | 0.050 | 0.060 | 120 | 0.050 | 0.046 | 92 |
| 150. 1,2,4-Trichlorobenzene | <0.005 | 0.050 | 0.0375 | 75 | 0.050 | 0.040 | 80 |
| AVERAGE RECOVERY FOR SEMIVOLATILES (BASE/NEUTRAL FRACTION) | | | | 104 | | | 103 |

*Percent recovery = 100 x $(C_i - C_o)/C_t$, where $C_i$ = amount [illegible] ed, $C_o$ = original amount found, and $C_t$ = amount spiked.

Source: Rollins Onsite Engineering Report (Reference 6).

Table C-2

## MATRIX SPIKE RECOVERIES FOR COMBUSTION GAS SCRUBBER DISCHARGE WATER (K019)

| Spike Constituent | Original Amount Found (ppm) | Sample Result | | | Duplicate Sample Result | | |
|---|---|---|---|---|---|---|---|
| | | Amount Spiked (ppm) | Amount Recovered (ppm) | Percent Recovery* (ppm) | Amount Spiked (ppm) | Amount Recovered (ppm) | Percent Recovery* (ppm) |
| VOLATILES | | | | | | | |
| 4. Benzene | <0.002 | 0.025 | 0.021 | 84 | 0.025 | 0.017 | 68 |
| 9. Chlorobenzene | <0.002 | 0.025 | 0.029 | 116 | 0.025 | 0.023 | 92 |
| 24. 1,1-Dichloroethene | <0.002 | 0.025 | 0.012 | 48 | 0.025 | 0.011 | 44 |
| 47. Trichloroethene | <0.002 | 0.025 | 0.021 | 84 | 0.025 | 0.027 | 108 |
| AVERAGE RECOVERY FOR VOLATILES | | | | 83 | | | 78 |
| SEMIVOLATILES (BASE/NEUTRAL FRACTION) | | | | | | | |
| 52. Acenaphthene | <0.005 | 0.050 | 0.051 | 102 | 0.050 | 0.051 | 102 |
| 88. 1,4-Dichlorobenzene | <0.002 | 0.050 | 0.034 | 68 | 0.050 | 0.035 | 70 |
| 102. 2,4-Dinitrotoluene | <0.002 | 0.050 | 0.043 | 86 | 0.050 | 0.042 | 84 |
| 105. N-Nitroso-di-n-propylamine | <0.005 | 0.050 | 0.050 | 100 | 0.050 | 0.046 | 92 |
| 145. Pyrene | <0.002 | 0.050 | 0.043 | 86 | 0.050 | 0.043 | 86 |
| 150. 1,2,4-Trichlorobenzene | <0.010 | 0.050 | 0.030 | 60 | 0.050 | 0.034 | 68 |
| AVERAGE RECOVERY FOR SEMIVOLATILES (BASE/NEUTRAL FRACTION) | | | | 84 | | | 84 |

*Percent recovery = 100 * $(C_1 - C_0)/C_t$, where $C_1$ = amount, $C_0$ = original amount found, and $C_t$ = amount spiked.

Source: Rollins Onsite Engineering Report (Reference 6).

Table C-3

MATRIX SPIKE RECOVERIES FOR METALS IN WASTEWATER RESIDUALS[+]

| Spike Constituent | Original Amount Found (ppb) | Amount Spiked (ppb) | Sample Result | | Duplicate Sample Result | |
|---|---|---|---|---|---|---|
| | | | Amount Recovered (ppb) | Percent Recovery* (%) | Amount Recovered (ppb) | Percent Recovery* (%) |
| 158. Cadmium | 4.2 | 25 | 26 | 87 | 27 | 91 |
| 159. Chromium (total) | <4.0 | 50 | 35 | 70 | 34 | 68 |
| 161. Lead | <5.0 | 25 | 22 | 88 | 19 | 76 |
| 163. Nickel | 203 | 1,000 | 1,140 | 94 | 1,128 | 93 |



[+]Matrix spike recoveries transferred from the Onsite Engineering Report for Horsehead (Reference 9).

*Percent recovery = $100 \times (C_i - C_o)/C_t$, where $C_i$ = amount recovered, $C_o$ = original amount found, and $C_t$ = amount spiked.

Table C-4

SUMMARY OF ACCURACY CORRECTION FACTORS FOR ORGANIC CONSTITUENTS (K019)

| | BDAT List Constituent | Accuracy Correction Factor* Rotary Kiln Ash Residue Total Concentration | Accuracy Correction Factor* Scrubber Water Total Concentration |
|---|---|---|---|
| 7. | Carbon tetrachloride | 1.06 | 1.28 |
| 9. | Chlorobenzene | 1.01 | 1.09 |
| 14. | Chloroform | 1.06 | 1.28 |
| 21. | Dichlorodifluoromethane | NA | 1.28 |
| 22. | 1,1-Dichloroethane | 1.06 | 1.28 |
| 23. | 1,2-Dichloroethane | 1.06 | 1.28 |
| 42. | Tetrachloroethene | 1.06 | 1.28 |
| 43. | Toluene | NA | 1.28 |
| 45. | 1,1,1-Trichloroethane | 1.06 | 1.28 |
| 47. | Trichloroethene | 0.93 | 1.19 |
| 68. | Bis(2-chloroethyl)ether | 0.97 | 1.19 |
| 70. | Bis(2-ethylhexyl)phthalate | 0.97 | NA |
| 88. | p-Dichlorobenzene | 1.11 | 1.47 |
| 98. | Di-n-butylphthalate | 0.97 | 1.19 |
| 109. | Flourene | 0.97 | 1.19 |
| 110. | Hexachlorobenzene | 0.97 | 1.19 |
| 113. | Hexachloroethane | 0.97 | 1.19 |
| 121. | Naphthalene | 0.97 | 1.19 |
| 136. | Pentachlorobenzene | 0.97 | 1.19 |
| 141. | Phenanthrene | 0.97 | 1.19 |
| 148. | 1,2,4,5-Tetrachlorobenzene | 0.97 | 1.10 |
| 150. | 1,2,4-Trichlorobenzene | 1.33 | 1.67 |

*The accuracy correction factor is equal to 100 divided by the percent recovery.

NA - Not Applicable.

Table C-5

SUMMARY OF ACCURACY CORRECTION FACTORS FOR METAL CONSTITUENTS

| | BDAT List Constituent | Accuracy Correction Factor* Wastewater Metals+ |
|---|---|---|
| 154. | Antimony | -- |
| 155. | Arsenic | -- |
| 156. | Barium | -- |
| 157. | Beryllium | -- |
| 158. | Cadmium | 1.149 |
| 159. | Chromium (total) | 1.471 |
| 221. | Chromium (hexavalent) | -- |
| 160. | Copper | -- |
| 161. | Lead | 1.316 |
| 162. | Mercury | 1.075 |
| 163. | Nickel | -- |
| 164. | Selenium | -- |
| 165. | Silver | -- |
| 166. | Thallium | -- |
| 167. | Vanadium | -- |
| 168. | Zinc | -- |

*The accuracy correction factor is equal to 100 divided by the percent recovery.

+The data used to calculate these accuracy correction factors were transferred from the Onsite Engineering Report for Horsehead (Reference 9).

Table C-6

ACCURACY CORRECTED DATA USED TO CALCULATE TREATMENT STANDARDS FOR REGULATED CONSTITUENTS IN K028 NONWASTEWATERS

| BDAT List Constituent | Corrected Total Concentration in the K019 Rotary Kiln Incinerator Ash, ppm* Sample Set: 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| **Volatiles** | | | | | | |
| 7. Carbon Tetrachloride | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 |
| 9. Chlorobenzene | 2.02 | 2.02 | 2.02 | 2.02 | 2.02 | 2.02 |
| 14. Chloroform | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 |
| 22. 1,1-Dichloroethane | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 |
| 23. 1,2-Dichloroethane | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 |
| 42. Tetrachloroethene | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 |
| 45. 1,1,1-Trichloroethane | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 |
| 47. Trichloroethene | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 | 2.13 |
| **Semivolatiles** | | | | | | |
| 68. Bis(2-chloroethyl)ether | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| 70. Bis(2-ethylhexyl)phthalate | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| 88. p-Dichlorobenzene | 2.22 | 2.22 | 2.22 | 2.22 | 2.22 | 2.22 |
| 98. Di-n-butyl phthalate | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| 110. Hexachlorobenzene | 10 | 10 | 10 | 10 | 10 | 10 |
| 113. Hexachloroethane | 10 | 10 | 10 | 10 | 10 | 10 |
| 121. Naphthalene | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| 136. Pentachlorobenzene | 10 | 10 | 10 | 10 | 10 | 10 |
| 141. Phenanthrene | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| 148. 1,2,4,5-Tetrachlorobenzene | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| 150. 1,2,4-Trichlorobenzene | 6.67 | 6.67 | 6.67 | 6.67 | 6.67 | 6.67 |

*Constituent concentrations have been corrected by multiplying by the Accuracy Correction Factor (ACF) for each constituent.

Table C-7

CORRECTED DATA USED TO CALCULATE TREATMENT STANDARDS FOR REGULATED CONSTITUENTS IN K028 WASTEWATERS

| BDAT List Constituent | Corrected Total Concentration in the K019 Combustion Gas Scrubber Water, ppm* | | | | | |
|---|---|---|---|---|---|---|
| Sample Set: | 1 | 2 | 3 | 4 | 5 | 6 |
| **Volatiles** | | | | | | |
| 7. Carbon tetrachloride | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| 9. Chlorobenzene | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| 14. Chloroform | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| 22. 1,1-Dichloroethane | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| 23. 1,2-Dichloroethane | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| 42. Tetrachlorethene | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| 45. 1,1,1-Trichloroethane | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| 47. Trichloroethene | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| **Semivolatiles** | | | | | | |
| 68. Bis(2-chloroethyl)ether | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| 88. p-Dichlorobenzene | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| 98. Di-n-butyl phthalate | 0.002 | 0.006 | 0.005 | 0.004 | 0.003 | 0.003 |
| 109. Fluorene | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| 110. Hexachlorobenzene | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 |
| 113. Hexachloroethane | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 |
| 121. Naphthalene | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| 136. Pentachlorobenzene | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 |
| 141. Phenanthrene | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| 148. 1,2,4,5-Tetrachlorobenzene | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 |
| 150. 1,2,4-Trichlorobenzene | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |

| | Corrected Total Concentration in the Treated K062 Mixture Wastewater ppm* | | |
|---|---|---|---|
| Sample Set: | 1 | 2 | 3 |
| **Metals** | | | |
| 158. Cadmium | 0.575 | 0.575 | 5.747 |
| 159. Chromium (total) | 0.221 | 0.176 | 0.265 |
| 161. Lead | 0.013 | 0.013 | 0.013 |
| 163. Nickel | 0.387 | 0.355 | 0.419 |

*Constituent concentrations have been corrected by multiplying by the Accuracy Correction Factor (ACF) for each constituent.

# APPENDIX D

## DETECTION LIMITS FOR WASTES AND TREATMENT RESIDUALS


| | Table Number |
|---|---|
| Detection Limits for the Tarpot Bottoms Sample - K028 (Reference 1) | D-1 |
| Detection Limits for the Spent Catalyst Sample - K028 (Reference 2) | D-2 |
| Detection Limits for the 1,1,1-Trichloroethane Still Bottoms Sample - K095 (Reference 2) | D-3 |
| Detection Limits for Incinerator Ash - K019 (Reference 6) | D-4 |
| Detection Limits for Incinerator Scrubber Water - K019 (Reference 6) | D-5 |

TABLE D-1: DETECTION LIMITS FOR THE TARPOT BOTTOMS SAMPLE - K028

| BOAT LIST CONSTITUENT | | DETECTION LIMIT |
|---|---|---|
| VOLATILE CONSTITUENTS * | | (ppm) |
| 222 | Acetone | 100000 |
| 1 | Acetonitrile | 1000000 |
| 2 | Acrolein | 1000000 |
| 3 | Acrylonitrile | 1000000 |
| 4 | Benzene | 50000 |
| 5 | Bromodichloromethane | 50000 |
| 6 | Bromomethane | 100000 |
| 7 | Carbon tetrachloride | 50000 |
| 8 | Carbon disulfide | 50000 |
| 9 | Chlorobenzene | 50000 |
| 10 | 2-Chloro-1,3-butadiene | 100000 |
| 11 | Chlorodibromomethane | 50000 |
| 12 | Chloroethane | 100000 |
| 13 | 2-Chloroethyl vinyl ether | 100000 |
| 14 | Chloroform | 50000 |
| 15 | Chloromethane | 100000 |
| 16 | 3-Chloropropene | 1000000 |
| 17 | 1,2-Dibromo-3-chloropropene | 100000 |
| 18 | 1,2-Dibromoethane | 50000 |
| 19 | Dibromomethane | 50000 |
| 20 | Trans-1,4-dichloro-2-butene | 1000000 |
| 21 | Dichlorodifluoromethane | 100000 |
| 22 | 1,1-Dichloroethane | 50000 |
| 23 | 1,2-Dichloroethane | 50000 |
| 24 | 1,1-Dichloroethylene | 50000 |
| 25 | Trans-1,2-dichloroethene | 50000 |
| 26 | 1,2-Dichloropropane | 50000 |
| 27 | Trans-1,3-dichloropropene | 50000 |
| 28 | cis-1,3-Dichloropropene | 50000 |
| 29 | 1,4-Dioxane | 2000000 |
| 226 | Ethyl benzene | 50000 |
| 30 | Ethyl cyanide | 1000000 |
| 31 | Ethyl methacrylate | 1000000 |
| 214 | Ethylene oxide | 4000000 |
| 32 | Iodomethane | 500000 |
| 33 | Isobutyl alcohol | 2000000 |
| 34 | Methyl ethyl ketone | 50000 |
| 229 | Methyl isobutyl ketone | 100000 |

* - Volatiles analyses required a dilution factor of 10,000,000 to analyze and quantitate the target analytes within the calibration range of the instrument. Therefore, the detection limits for the volatiles are exceedingly high (some >100%) as shown in this table.

TABLE D-1: DETECTION LIMITS FOR THE TARPOT BOTTOMS SAMPLE - K028
[continued]

| BOAT LIST CONSTITUENT | DETECTION LIMIT |
|---|---|
| VOLATILE CONSTITUENTS [continued] * | [ppm] |
| 35 Methyl methacrylate | 1000000 |
| 37 Methylacrylonitrile | 1000000 |
| 38 Methylene chloride | 50000 |
| 39 Pyridine | 4000000 |
| 40 1,1,1,2-Tetrachloroethane | 50000 |
| 41 1,1,2,2-Tetrachloroethane | 50000 |
| 42 Tetrachloroethene | 50000 |
| 43 Toluene | 50000 |
| 44 Tribromomethane | 50000 |
| 45 1,1,1-Trichloroethane | 50000 |
| 46 1,1,2-Trichloroethane | 50000 |
| 47 Trichloroethene | 50000 |
| 48 Trichloromonofluoromethane | 50000 |
| 49 1,2,3-Trichloropropane | 50000 |
| 50 Vinyl chloride | 100000 |
| 215 1,2-Xylene | 50000 |
| 216 1,3-Xylene | 50000 |
| 217 1,4-Xylene | 50000 |
| SEMIVOLATILE CONSTITUENTS | [ppm] |
| 51 Acenapthalene | 94 |
| 52 Acenapthene | 94 |
| 53 Acetophenone | 188 |
| 54 2-Acetylaminofluorene | 188 |
| 55 4-Aminobiphenyl | 188 |
| 56 Aniline | 94 |
| 57 Anthracene | 94 |
| 58 Aramite | NA |
| 59 Benz[a]anthracene | 94 |
| 60 Benzenethiol | NA |
| 62 Benzo[a]pyrene | 94 |
| 63 Benzo[b]fluoranthene | 94 |
| 64 Benzo[g,h,i]perylene | 94 |
| 65 Benzo[k]fluoranthene | 94 |
| 66 p-Benzoquinone | NA |

NA - The compound was searched using an NBS Library database of 42,000 compounds. The detection limit is not available.

* - Volatiles analyses required a dilution factor of 10,000,000 to analyze and quantitate the target analytes within the calibration range of the instrument. Therefore, the detection limits for the volatiles are exceedingly high [some >100%] as shown in this table.

TABLE D-1: DETECTION LIMITS FOR THE TARPOT BOTTOMS SAMPLE - K028
[continued]

| BOAT LIST CONSTITUENT | DETECTION LIMIT |
|---|---|
| SEMIVOLATILE CONSTITUENTS [continued] | [ppm] |
| 67 Bis(2-chloroethoxy)ethane | 94 |
| 68 Bis(2-chloroethyl)ether | 94 |
| 69 Bis(2-chloroisopropyl)ether | 94 |
| 70 Bis(2-ethylhexyl)phthalate | 94 |
| 71 4-Bromophenyl phenyl ether | 94 |
| 72 Butyl benzyl phthalate | 94 |
| 73 2-sec-Butyl-4,6-dinitrophenol | 470 |
| 74 p-Chloroaniline | 94 |
| 75 Chlorobenzilate | NA |
| 76 p-Chloro-m-cresol | 94 |
| 77 2-Chloronaphthalene | 94 |
| 78 2-Chlorophenol | 94 |
| 79 3-Chloropropionitrile | NA |
| 80 Chrysene | 94 |
| 81 ortho-Cresol | 94 |
| 82 para-Cresol | 94 |
| 83 Dibenz(a,h)anthracene | 94 |
| 84 Dibenzo(a,e)pyrene | NA |
| 85 Dibenzo(a,i)pyrene | NA |
| 86 m-Dichlorobenzene | 94 |
| 87 o-Dichlorobenzene | 94 |
| 88 p-Dichlorobenzene | 94 |
| 89 3,3'-Dichlorobenzidine | 188 |
| 90 2,4-Dichlorophenol | 94 |
| 91 2,6-Dichlorophenol | NA |
| 92 Diethyl phthalate | 94 |
| 93 3,3'-Dimethoxybenzidine | 94 |
| 94 p-Dimethylaminoazobenzene | 188 |
| 95 3,3'-Dimethylbenzidine | NA |
| 96 2,4-Dimethylphenol | 94 |
| 97 Dimethyl phthalate | 94 |
| 98 Di-n-butyl phthalate | 94 |
| 99 1,4-Dinitrobenzene | 470 |
| 100 4,6-Dinitro-o-cresol | 470 |
| 101 2,4-Dinitrophenol | 470 |
| 102 2,4-Dinitrotoluene | 94 |
| 103 2,6-Dinitrotoluene | 94 |
| 104 Di-n-octyl phthalate | 94 |
| 105 Di-n-propylnitrosamine | 94 |
| 106 Diphenylamine | 94 |
| 219 Diphenylnitrosamine | 188 |
| 107 1,2-Diphenylhydrazine | 470 |

NA - The compound was searched using an NBS Library database of 42,000 compounds. The detection limit is not available.

TABLE D-1: DETECTION LIMITS FOR THE TARPOT BOTTOMS SAMPLE - K028 (continued)

| BOAT LIST CONSTITUENT | | DETECTION LIMIT |
|---|---|---|
| | SEMIVOLATILE CONSTITUENTS (continued) | (ppm) |
| 108 | Fluoranthene | 94 |
| 109 | Fluorene | 94 |
| 110 | Hexachlorobenzene | 94 |
| 111 | Hexachlorobutadiene | 94 |
| 112 | Hexachlorocyclopentadiene | 94 |
| 113 | Hexachloroethane | 94 |
| 114 | Hexachlorophene | NA |
| 115 | Hexachloropropene | NA |
| 116 | Indeno(1,2,3-cd)pyrene | 94 |
| 117 | Isosafrole | 188 |
| 118 | Methapyrilene | NA |
| 119 | 3-Methylcholanthrene | 188 |
| 120 | 4,4'-Methylenebis(2-chloroaniline) | 188 |
| 38 | Methyl methanesulfonate | NA |
| 121 | Naphthalene | 94 |
| 122 | 1,4-Naphthoquinone | NA |
| 123 | 1-Naphthylamine | 470 |
| 124 | 2-Naphthylamine | 470 |
| 125 | p-Nitroaniline | 470 |
| 126 | Nitrobenzene | 94 |
| 127 | 4-Nitrophenol | 470 |
| 128 | N-Nitrosodi-n-butylamine | NA |
| 129 | N-Nitrosodiethylamine | NA |
| 130 | N-Nitrosodimethylamine | 94 |
| 131 | N-Nitrosomethylethylamine | 94 |
| 132 | N-Nitrosomorpholine | 188 |
| 133 | N-Nitrosopiperidine | 94 |
| 134 | N-Nitrosopyrrolidine | 470 |
| 135 | 5-Nitro-o-toluidine | 188 |
| 136 | Pentachlorobenzene | NA |
| 137 | Pentachloroethane | NA |
| 138 | Pentachloronitrobenzene | 940 |
| 139 | Pentachlorophenol | 470 |
| 140 | Phenacetin | 188 |
| 141 | Phenanthrene | 94 |
| 142 | Phenol | 94 |
| 143 | 2-Picoline | 94 |
| 144 | Pronamide | NA |
| 145 | Pyrene | 94 |

NA - The compound was searched using an NBS Library database of 42,000 compounds. The detection limit is not available.

TABLE D-1: DETECTION LIMITS FOR THE TARPOT BOTTOMS SAMPLE - K028
(continued)

| BOAT LIST CONSTITUENT | DETECTION LIMIT |
|---|---|
| **SEMIVOLATILE CONSTITUENTS (continued)** | (ppm) |
| 146 Resorcinol | NA |
| 147 Safrole | 470 |
| 148 1,2,4,5-Tetrachlorobenzene | 188 |
| 149 2,3,4,6-Tetrachlorophenol | NA |
| 150 1,2,4-Trichlorobenzene | 94 |
| 151 2,4,5-Trichlorophenol | 470 |
| 152 2,4,6-Trichlorophenol | 94 |
| 153 Tris(2,3-dibromopropyl) phosphate | NA |
| **METAL CONSTITUENTS** | (ppm) |
| 154 Antimony | 2.1 |
| 155 Arsenic | 1 |
| 156 Barium | 0.1 |
| 157 Beryllium | 0.2 |
| 158 Cadmium | 0.3 |
| 159 Chromium, total | 0.5 |
| 160 Copper | 0.1 |
| 161 Lead | 10 |
| 162 Mercury | 0.1 |
| 163 Nickel | 2.5 |
| 164 Selenium | 0.5 |
| 165 Silver | 0.1 |
| 166 Thallium | 1000 |
| 167 Vanadium | 0.2 |
| 168 Zinc | 4 |
| **TCLP METAL CONSTITUENTS** | (ppm) |
| 154 Antimony | 0.021 |
| 155 Arsenic | 0.01 |
| 156 Barium | 0.001 |
| 157 Beryllium | 0.002 |
| 158 Cadmium | 0.03 |
| 159 Chromium, total | 0.005 |
| 221 Chromium, hexavalent | 0.1 |
| 160 Copper | 0.001 |
| 161 Lead | 0.005 |
| 162 Mercury | 0.0002 |
| 163 Nickel | 0.025 |
| 164 Selenium | 0.05 |
| 165 Silver | 0.01 |
| 166 Thallium | 0.01 |
| 167 Vanadium | 0.02 |
| 168 Zinc | 0.004 |

NA - The compound was searched using an NBS Library database of 42,000 compounds. The detection limit is not available.

TABLE D-1: DETECTION LIMITS FOR THE TARPOT BOTTOMS SAMPLE - K028
(continued)

| BOAT LIST CONSTITUENT | DETECTION LIMIT |
|---|---|
| INORGANIC CONSTITUENTS | (ppm) |
| 169 Cyanide | 0.51 |
| 171 Sulfide | 100 |

Source: Dow Chemical Company Characterization Report (Reference 1).

TABLE D-2: DETECTION LIMITS FOR THE SPENT CATALYST SAMPLE - K028

| BOAT LIST CONSTITUENT * | DETECTION LIMIT [ppm] |
|---|---|
| VOLATILE CONSTITUENTS | |
| 222 Acetone | ** |
| 2 Acrolein | ** |
| 4 Benzene | ** |
| 5 Bromodichloromethane | ** |
| 7 Carbon tetrachloride | ** |
| 9 Chlorobenzene | ** |
| 12 Chloroethane | ** |
| 13 2-Chloroethyl vinyl ether | ** |
| 14 Chloroform | ** |
| 15 Chloromethane | ** |
| 16 3-Chloropropene | ** |
| 20 Trans-1,4-dichloro-2-butene | ** |
| 21 Dichlorodifluoromethane | ** |
| 22 1,1-Dichloroethane | ** |
| 23 1,2-Dichloroethane | ** |
| 24 1,1-Dichloroethylene | ** |
| 25 Trans-1,2-dichloroethene | ** |
| 26 1,2-Dichloropropane | ** |
| 27 Trans-1,3-dichloropropene | ** |
| 28 cis-1,3-Dichloropropene | ** |
| 226 Ethyl benzene | ** |
| 34 Methyl ethyl ketone | ** |
| 229 Methyl isobutyl ketone | ** |
| 36 Methylene chloride | ** |
| 40 1,1,1,2-Tetrachloroethane | ** |
| 41 1,1,2,2-Tetrachloroethane | ** |
| 42 Tetrachloroethene | ** |
| 43 Toluene | ** |
| 45 1,1,1-Trichloroethane | ** |
| 46 1,1,2-Trichloroethane | ** |
| 47 Trichloroethene | ** |
| 48 Trichloromonofluoromethane | ** |
| 49 1,2,3-Trichloropropane | ** |
| 231 1,1,2-Trichloro-1,2,2-trifluoroethane | ** |
| 50 Vinyl chloride | ** |
| 215 1,2-Xylene | ** |
| 216 1,3-Xylene | |
| 217 1,4-Xylene | |

TABLE D-2: DETECTION LIMITS FOR THE SPENT CATALYST SAMPLE - K028
(continued)

| BDAT LIST CONSTITUENT * | | DETECTION LIMIT (ppm) |
|---|---|---|
| SEMIVOLATILE CONSTITUENTS | | |
| 67 | Bis(2-chloroethoxy)ethane | ** |
| 68 | Bis(2-chloroethyl)ether | ** |
| 69 | Bis(2-chloroisopropyl)ether | ** |
| 71 | 4-Bromophenyl phenyl ether | ** |
| 76 | p-Chloro-m-cresol | ** |
| 77 | 2-Chloronaphthalene | ** |
| 78 | 2-Chlorophenol | ** |
| 86 | m-Dichlorobenzene | ** |
| 87 | o-Dichlorobenzene | ** |
| 88 | p-Dichlorobenzene | ** |
| 90 | 2,4-Dichlorophenol | ** |
| 91 | 2,6-Dichlorophenol | ** |
| 110 | Hexachlorobenzene | ** |
| 111 | Hexachlorobutadiene | ** |
| 112 | Hexachlorocyclopentadiene | ** |
| 113 | Hexachloroethane | ** |
| 115 | Hexachloropropene | ** |
| 136 | Pentachlorobenzene | ** |
| 137 | Pentachloroethane | ** |
| 139 | Pentachlorophenol | ** |
| 148 | 1,2,4,5-Tetrachlorobenzene | ** |
| 149 | 2,3,4,6-Tetrachlorophenol | ** |
| 150 | 1,2,4-Trichlorobenzene | ** |
| 151 | 2,4,5-Trichlorophenol | ** |
| 152 | 2,4,6-Trichlorophenol | |

* BDAT constituents that are not listed were not analyzed.

NR Not reported.

Source: PPG Industries Analytical Data Report [Reference 18].

** This information has been claimed as RCRA Confidential Business Information. This information can be found in the confidential portion of the Administrative Record for this rulemaking.

TABLE D-3: DETECTION LIMITS FOR THE 1,1,1-TRICHLOROETHANE STILL BOTTOMS SAMPLE - K095

| BOAT LIST CONSTITUENT * | DETECTION LIMIT |
|---|---|
| VOLATILE CONSTITUENTS | (ppm) |
| 222 Acetone | ** |
| 2 Acrolein | ** |
| 4 Benzene | ** |
| 5 Bromodichloromethane | ** |
| 7 Carbon tetrachloride | ** |
| 9 Chlorobenzene | ** |
| 12 Chloroethane | ** |
| 13 2-Chloroethyl vinyl ether | ** |
| 14 Chloroform | ** |
| 15 Chloromethane | ** |
| 16 3-Chloropropene | ** |
| 20 Trans-1,4-dichloro-2-butene | ** |
| 21 Dichlorodifluoromethane | ** |
| 22 1,1-Dichloroethane | ** |
| 23 1,2-Dichloroethane | ** |
| 24 1,1-Dichloroethylene | ** |
| 25 Trans-1,2-dichloroethene | ** |
| 26 1,2-Dichloropropane | ** |
| 27 Trans-1,3-dichloropropene | ** |
| 28 cis-1,3-Dichloropropene | ** |
| 228 Ethyl benzene | ** |
| 34 Methyl ethyl ketone | ** |
| 229 Methyl isobutyl ketone | ** |
| 36 Methylene chloride | ** |
| 40 1,1,1,2-Tetrachloroethane | ** |
| 41 1,1,2,2-Tetrachloroethane | ** |
| 42 Tetrachloroethene | ** |
| 43 Toluene | ** |
| 45 1,1,1-Trichloroethane | ** |
| 46 1,1,2-Trichloroethane | ** |
| 47 Trichloroethene | ** |
| 48 Trichloromonofluoromethane | ** |
| 49 1,2,3-Trichloropropane | ** |
| 231 1,1,2-Trichloro-1,2,2-trifluoroethane | ** |
| 50 Vinyl chloride | ** |
| 215 1,2-Xylene | ** |
| 216 1,3-Xylene | ** |
| 217 1,4-Xylene | ** |

TABLE D-3: DETECTION LIMITS FOR THE 1,1,1-TRICHLOROETHANE STILL BOTTOMS SAMPLE - K095
(continued)

| BDAT LIST CONSTITUENT * | | DETECTION LIMIT |
|---|---|---|
| | SEMIVOLATILE CONSTITUENTS | (ppm) |
| 87 | Bis(2-chloroethoxy)ethane | ** |
| 88 | Bis(2-chloroethyl)ether | ** |
| 89 | Bis(2-chloroisopropyl)ether | ** |
| 71 | 4-Bromophenyl phenyl ether | ** |
| 76 | p-Chloro-m-cresol | ** |
| 77 | 2-Chloronaphthalene | ** |
| 78 | 2-Chlorophenol | ** |
| 86 | m-Dichlorobenzene | ** |
| 87 | o-Dichlorobenzene | ** |
| 88 | p-Dichlorobenzene | ** |
| 90 | 2,4-Dichlorophenol | ** |
| 91 | 2,6-Dichlorophenol | ** |
| 110 | Hexachlorobenzene | ** |
| 111 | Hexachlorobutadiene | ** |
| 112 | Hexachlorocyclopentadiene | ** |
| 113 | Hexachloroethane | ** |
| 115 | Hexachloropropene | ** |
| 136 | Pentachlorobenzene | ** |
| 137 | Pentachloroethane | ** |
| 139 | Pentachlorophenol | ** |
| 148 | 1,2,4,5-Tetrachlorobenzene | ** |
| 149 | 2,3,4,6-Tetrachlorophenol | ** |
| 150 | 1,2,4-Trichlorobenzene | ** |
| 151 | 2,4,5-Trichlorophenol | ** |
| 152 | 2,4,6-Trichlorophenol | ** |

* BDAT constituents that are not listed were not analyzed.

NR Not reported.

Source: PPG Industries Analytical Data Report (Reference 18).

** This information has been claimed as RCRA Confidential Business Information. This informaton can be found in the confidential portion of the Administrative Record for this rulemaking.

Table D-4: Detection Limits for Incinerator Ash - K019

| BDAT CONSTITUENT | DETECTION LIMIT [ppm] |
|---|---|
| VOLATILE CONSTITUENTS: | |
| 1 Acetonitrile | 10 |
| 2 Acrolein | 100 |
| 3 Acrylonitrile | 10 |
| 4 Benzene | 2 |
| 5 Bromodichloromethane | 2 |
| 6 Bromomethane | 2 |
| 7 Carbon tetrachloride | 2 |
| 8 Carbon disulfide | NA |
| 9 Chlorobenzene | 2 |
| 10 2-Chloro-1,3-butadiene | 2 |
| 11 Chlorodibromomethane | 2 |
| 12 Chloroethane | 2 |
| 13 2-Chloroethyl vinyl ether | NA |
| 14 Chloroform | 2 |
| 15 Chloromethane | 2 |
| 16 3-Chloropropene | 2 |
| 17 1,2-Dibromo-3-chloropropane | 2 |
| 18 1,2-Dibromoethane | 2 |
| 19 Dibromomethane | 2 |
| 20 Trans-1,4-dichloro-2-butene | 10 |
| 21 Dichlorodifluoromethane | 2 |
| 22 1,1-Dichloroethane | 2 |
| 23 1,2-Dichloroethane | 2 |
| 24 1,1-Dichloroethylene | 2 |
| 25 Trans-1,2-dichloroethene | 2 |
| 26 1,2-Dichloropropane | 5 |
| 27 Trans-1,3-dichloropropene | 5 |
| 28 cis-1,3-Dichloropropene | 5 |
| 29 1,4-Dioxane | NA |
| 30 Ethyl cyanide | 100 |
| 31 Ethyl methacrylate | 2 |
| 32 Iodomethane | 2 |
| 33 Isobutyl alcohol | 2 |
| 34 Methyl ethyl ketone | 10 |
| 35 Methyl methacrylate | 2 |
| 37 Methylacrylonitrile | 10 |
| 38 Methylene chloride | 10 |
| 40 1,1,1,2-Tetrachloroethane | 2 |
| 41 1,1,2,2-Tetrachloroethane | 2 |
| 42 Tetrachloroethene | 2 |
| 43 Toluene | 2 |
| 44 Tribromomethane | 2 |
| 45 1,1,1-Trichloroethane | 2 |
| 46 1,1,2-Trichloroethane | 2 |

| BDAT CONSTITUENT | DETECTION LIMIT [ppm] |
|---|---|
| VOLATILE CONSTITUENTS: | |
| 47 Trichloroethene | 2 |
| 48 Trichloromonofluoromethane | 2 |
| 49 1,2,3-Trichloropropane | 5 |
| 50 Vinyl chloride | 2 |
| 79 3-Chloropropionitrile + | NA |
| • Acetone | 10 |
| • Allyl alcohol | NA |
| • Ethyl benzene | 2 |
| • Ethylene oxide | NA |
| • 2-Hexanone | 10 |
| • Malononitrile | NA |
| • 4-Methyl-2-pentanone | 10 |
| • 2-Propyn-1-ol | NA |
| • Styrene | 2 |
| • Trichloromethanethiol | NA |
| • Vinyl acetate | 2 |
| • Xylene [total] | 2 |

Table D-4: Detection Limits for Incinerator Ash - K019
(Continued)

| BDAT CONSTITUENT | | DETECTION LIMIT |
|---|---|---|
| **SEMIVOLATILE CONSTITUENTS:** | | [ppm] |
| 38 | Methyl methanesulfonate ++ | 10 |
| 39 | Pyridine ++ | 20 |
| 51 | Acenaphthalene | 2 |
| 52 | Acenaphthene | 2 |
| 53 | Acetophenone | 2 |
| 54 | 2-Acetylaminofluorene | NA |
| 55 | 4-Aminobiphenyl | 2 |
| 56 | Aniline | 5 |
| 57 | Anthracene | 2 |
| 58 | Aramite | NA |
| 59 | Benz[a]anthracene | 2 |
| 60 | Benzenethiol | NA |
| 61 | Benzidine | 2 |
| 62 | Benzo[a]pyrene | 2 |
| 63 | Benzo[b]fluoranthene | NA |
| 64 | Benzo[g,h,i]perylene | 5 |
| 65 | Benzo[k]fluoranthene | 2 |
| 66 | p-Benzoquinone | NA |
| 67 | Bis(2-chloroethoxy)ethane | 2 |
| 68 | Bis(2-chloroethyl)ether | 2 |
| 69 | Bis(2-chloroisopropyl)ether | 2 |
| 70 | Bis(2-ethylhexyl)phthalate | 2 |
| 71 | 4-Bromophenyl phenyl ether | 10 |
| 72 | Butyl benzyl phthalate | 2 |
| 73 | 2-sec-Butyl-4,6-dinitrophenol | NA |
| 74 | p-Chloroaniline | 5 |
| 75 | Chlorobenzilate | NA |
| 76 | p-Chloro-m-cresol | 5 |
| 77 | 2-Chloronaphthalene | 2 |
| 78 | 2-Chlorophenol | 2 |
| 80 | Chrysene | 2 |
| 81 | ortho-Cresol | 2 |
| 82 | para-Cresol | 2 |
| 83 | Dibenz[a,h]anthracene | 2 |
| 84 | Dibenzo[a,e]pyrene | NA |
| 85 | Dibenzo[a,i]pyrene | NA |
| 86 | m-Dichlorobenzene | 2 |
| 87 | o-Dichlorobenzene | 2 |
| 88 | p-Dichlorobenzene | 2 |
| 89 | 3,3'-Dichlorobenzidine | 10 |
| 90 | 2,4-Dichlorophenol | 5 |
| 91 | 2,6-Dichlorophenol | 5 |
| 92 | Diethyl phthalate | 2 |
| 93 | 3,3'-Diethoxybenzidine | 10 |
| 94 | p-Diethylaminoazobenzene | 5 |
| 95 | 3,3'-Dimethylbenzidine | NA |
| 96 | 2,4-Dimethylphenol | 5 |

| BDAT CONSTITUENT | | DETECTION LIMIT |
|---|---|---|
| **SEMIVOLATILE CONSTITUENTS:** | | [ppm] |
| 97 | Dimethyl phthalate | 2 |
| 98 | Di-n-butyl phthalate | 2 |
| 99 | 1,4-Dinitrobenzene | 10 |
| 100 | 4,6-Dinitro-o-cresol | 50 |
| 101 | 2,4-Dinitrophenol | 50 |
| 102 | 2,4-Dinitrotoluene | 50 |
| 103 | 2,6-Dinitrotoluene | 10 |
| 104 | Di-n-octyl phthalate | 2 |
| 105 | Di-n-propylnitrosamine | 5 |
| 106 | Diphenylamine | 2 |
| 107 | 1,2-Diphenylhydrazine | 2 |
| 108 | Fluoranthene | 2 |
| 109 | Fluorene | 2 |
| 110 | Hexachlorobenzene | 10 |
| 111 | Hexachlorobutadiene | 10 |
| 112 | Hexachlorocyclopentadiene | 10 |
| 113 | Hexachloroethane | 10 |
| 114 | Hexachlorophene | NA |
| 115 | Hexachloropropene | 10 |
| 116 | Indeno[1,2,3-c,d]pyrene | 5 |
| 117 | Isosafrole | NA |
| 118 | Metha[illegible]ilene | NA |
| 119 | 3-Met[illegible]cholanthrene | NA |
| 120 | 4,4'-[illegible]thylenebis(2-chloroaniline) | NA |
| 121 | Napht[illegible]ene | 2 |
| 122 | 1,4-N[illegible]phthoquinone | 2 |
| 123 | 1-Naph[illegible]ylamine | 2 |
| 124 | 2-Naphthylamine | 2 |
| 125 | p-Nitroaniline | 10 |
| 126 | Nitrobenzene | 5 |
| 127 | 4-Nitrophenol | 10 |
| 128 | N-Nitrosodi-n-butylamine | 5 |
| 129 | N-Nitrosodiethylamine | 10 |
| 130 | N-Nitrosodimethylamine | 20 |
| 131 | N-Nitrosomethylethylamine | NA |
| 132 | N-Nitr[illegible]somorpholine | 10 |
| 133 | N-Nitrosopiperidine | 10 |
| 134 | N-Nitr[illegible]sopyrrolidine | 10 |
| 135 | 5-Nitro-o-toluidine | NA |
| 136 | Pentachlorobenzene | 10 |
| 137 | Pentachloroethane | 10 |
| 138 | Pentachloronitrobenzene | 10 |
| 139 | Pentachlorophenol | 50 |
| 140 | Phenacetin | 2 |
| 141 | Phenanthrene | 2 |
| 142 | Phenol | 2 |
| 143 | 2-Picoline | 20 |

Table D-4: Detection Limits for Incinerator Ash - K019
(Continued)

| BDAT CONSTITUENT | DETECTION LIMIT |
|---|---|
| **SEMIVOLATILES (CONTINUED):** | [ppm] |
| 144 Pronamide | 10 |
| 145 Pyrene | 2 |
| 146 Resorcinol | NA |
| 147 Safrole | NA |
| 148 1,2,4,5-Tetrachlorobenzene | 5 |
| 149 2,3,4,6-Tetrachlorophenol | 10 |
| 150 1,2,4-Trichlorobenzene | 5 |
| 151 2,4,5-Trichlorophenol | 10 |
| 152 2,4,6-Trichlorophenol | 10 |
| 153 Tris(2,3-dibromopropyl) phosphate | NA |
| • 7,12-Dimethylbenz(a)anthracene | 5 |
| • alpha,alpha-Dimethylphenethylamine | 10 |
| • Benzoic acid | 50 |
| • Benzyl alcohol | 5 |
| • 4-Chlorophenyl phenyl ether | 5 |
| • Dibenzofuran | 2 |
| • Dibenzo(a,h)pyrene | NA |
| • Isophorone | 2 |
| • 2-Methylnaphthalene | 2 |
| • 2-Nitroaniline | 10 |
| • 3-Nitroaniline | 10 |
| • 2-Nitrophenol | 10 |
| • N-Nitrosodiphenylamine | 2 |

| BDAT CONSTITUENT | DETECTION LIMIT |
|---|---|
| **METALS:** | [ppm] |
| 154 Antimony | 9.0 |
| 155 Arsenic | 0.2 |
| 156 Barium | 0.9 |
| 157 Beryllium | 0.* |
| 158 Cadmium | 0.3 |
| 159 Chromium | 0.9 |
| 160 Chromium, hexavalent | 0.2 |
| 161 Copper | 1.0 |
| 162 Lead | 0.2 |
| 163 Mercury | 0.05 |
| 164 Nickel | 2.0 |
| 165 Selenium | 0.5 |
| 166 Silver | 0.9 |
| 167 Thallium | 0.2 |
| 168 Vanadium | 2.0 |
| 169 Zinc | 0.8 |
| **OTHER CONSTITUENTS:** | [ppm] |
| 169 Total Cyanide | 0.47 |
| 170 Fluoride | 2 |
| 171 Sulfide | 50 |
| **PHYSICAL PARAMETERS:** | |
| Paint Filter Test (% free liquid) | 0.5 |
| Total Solids (% residue) | 0.05 |

NA The standard is not available; the compound was searched using an NBS library database of 42,000 compounds.

• This constituent is not on the list of constituents in the GENERIC QUALITY ASSURANCE PROJECT PLAN FOR LAND DISPOSAL RESTRICTIONS PROGRAM ("BDAT"), EPA/530-SW-87-011, March 1987. It is a ground-water monitoring constituent as listed in Appendix IX, Page 29839, of the FEDERAL REGISTER, Vol. 51, No. 142.

+ The compound appears in the GENERIC QUALITY ASSURANCE PROJECT PLAN as a semivolatile constituent but was analyzed as a volatile constituent.

↔ The compound appears in the GENERIC QUALITY ASSURANCE PROJECT PLAN as a volatile constituent but was analyzed as a semivolatile constituent.

Table D-5: Detection Limits for Incinerator Scrubber Water - K019

| BOAT CONSTITUENT | DETECTION LIMIT (ppb) | BOAT CONSTITUENT | DETECTION LIMIT (ppb) |
|---|---|---|---|
| VOLATILE CONSTITUENTS: | | VOLATILE CONSTITUENTS: | |
| 1 Acetonitrile | 10 | 47 Trichloroethene | 2 |
| 2 Acrolein | 100 | 48 Trichloromonofluoromethane | 2 |
| 3 Acrylonitrile | 10 | 49 1,2,3-Trichloropropane | 2 |
| 4 Benzene | 2 | 50 Vinyl chloride | 2 |
| 5 Bromodichloromethane | 2 | 79 3-Chloropropionitrile + | NA |
| 6 Bromomethane | 2 | * Acetone | 10 |
| 7 Carbon tetrachloride | 2 | * Allyl alcohol | NA |
| 8 Carbon disulfide | NA | * Ethyl benzene | 2 |
| 9 Chlorobenzene | 2 | * Ethylene oxide | NA |
| 10 2-Chloro-1,3-butadiene | 2 | * 2-Hexanone | 10 |
| 11 Chlorodibromomethane | 2 | * Malononitrile | NA |
| 12 Chloroethane | 2 | * 4-Methyl-2-pentanone | 10 |
| 13 2-Chloroethyl vinyl ether | NA | * 2-Propyn-1-ol | NA |
| 14 Chloroform | 2 | * Styrene | 2 |
| 15 Chloromethane | 2 | * Trichloromethanethiol | NA |
| 16 3-Chloropropene | 2 | * Vinyl acetate | 2 |
| 17 1,2-Dibromo-3-chloropropane | 2 | * Xylene (total) | 2 |
| 18 1,2-Dibromoethane | 2 | | |
| 19 Dibromomethane | 2 | | |
| 20 Trans-1,4-dichloro-2-butene | 10 | | |
| 21 Dichlorodifluoromethane | 2 | | |
| 22 1,1-Dichloroethane | 2 | | |
| 23 1,2-Dichloroethane | 2 | | |
| 24 1,1-Dichloroethylene | 2 | | |
| 25 Trans-1,2-dichloroethene | 2 | | |
| 26 1,2-Dichloropropane | 2 | | |
| 27 Trans-1,3-dichloropropene | 2 | | |
| 28 cis-1,3-Dichloropropene | 2 | | |
| 29 1,4-Dioxane | NA | | |
| 30 Ethyl cyanide | 100 | | |
| 31 Ethyl methacrylate | 2 | | |
| 32 Iodomethane | 2 | | |
| 33 Isobutyl alcohol | 2 | | |
| 34 Methyl ethyl ketone | 10 | | |
| 35 Methyl methacrylate | 2 | | |
| 37 Methylacrylonitrile | 10 | | |
| 38 Methylene chloride | 10 | | |
| 40 1,1,1,2-Tetrachloroethane | 2 | | |
| 41 1,1,2,2-Tetrachloroethane | 2 | | |
| 42 Tetrachloroethene | 2 | | |
| 43 Toluene | 2 | | |
| 44 Tribromomethane | 2 | | |
| 45 1,1,1-Trichloroethane | 2 | | |
| 46 1,1,2-Trichloroethane | 2 | | |

Table D-5: Detection Limits for Incinerator Scrubber Water - RCRA (Continued)

| BOAT CONSTITUENT | DETECTION LIMIT | BOAT CONSTITUENT | DETECTION LIMIT |
|---|---|---|---|
| SEMIVOLATILE CONSTITUENTS: | (ppb) | SEMIVOLATILE CONSTITUENTS: | (ppb) |
| 38 Methyl methanesulfonate ++ | 10 | 97 Dimethyl phthalate | 2 |
| 39 Pyridine ++ | 20 | 98 Di-n-butyl phthalate | 2 |
| 51 Acenaphthalene | 2 | 99 1,4-Dinitrobenzene | 10 |
| 52 Acenaphthene | 2 | 100 4,6-Dinitro-o-cresol | 50 |
| 53 Acetophenone | 2 | 101 2,4-Dinitrophenol | 50 |
| 54 2-Acetylaminofluorene | NA | 102 2,4-Dinitrotoluene | 50 |
| 55 4-Aminobiphenyl | 2 | 103 2,6-Dinitrotoluene | 10 |
| 56 Aniline | 5 | 104 Di-n-octyl phthalate | 2 |
| 57 Anthracene | 2 | 105 Di-n-propylnitrosamine | 5 |
| 58 Aramite | NA | 106 Diphenylamine | 2 |
| 59 Benz[a]anthracene | 2 | 107 1,2-Diphenylhydrazine | 2 |
| 60 Benzenethiol | NA | 108 Fluoranthene | 2 |
| 61 Benzidine | 2 | 109 Fluorene | 2 |
| 62 Benzo[a]pyrene | 2 | 110 Hexachlorobenzene | 10 |
| 63 Benzo[b]fluoranthene | NA | 111 Hexachlorobutadiene | 10 |
| 64 Benzo[g,h,i]perylene | 5 | 112 Hexachlorocyclopentadiene | 10 |
| 65 Benzo[k]fluoranthene | 2 | 113 Hexachloroethane | 10 |
| 66 p-Benzoquinone | NA | 114 Hexachlorophene | NA |
| 67 Bis[2-chloroethoxy]ethane | 2 | 115 Hexachloropropene | 10 |
| 68 Bis[2-chloroethyl]ether | 2 | 116 Indeno[1,2,3-c,d]pyrene | 5 |
| 69 Bis[2-chloroisopropyl]ether | 2 | 117 Isosafrole | NA |
| 70 Bis[2-ethylhexyl]phthalate | 2 | 118 Methapyrilene | NA |
| 71 4-Bromophenyl phenyl ether | 10 | 119 3-Methylcholanthrene | NA |
| 72 Butyl benzyl phthalate | 2 | 120 4,4-Methylenebis[2-chloroaniline] | NA |
| 73 2-sec-Butyl-4,6-dinitrophenol | NA | 121 Naphthalene | 2 |
| 74 p-Chloroaniline | 5 | 122 1,4-Naphthoquinone | 2 |
| 75 Chlorobenzilate | NA | 123 1-Naphthylamine | 2 |
| 76 p-Chloro-m-cresol | 5 | 124 2-Naphthylamine | 2 |
| 77 2-Chloronaphthalene | 2 | 125 p-Nitroaniline | 10 |
| 78 2-Chlorophenol | 2 | 126 Nitrobenzene | 5 |
| 80 Chrysene | 2 | 127 4-Nitrophenol | 10 |
| 81 ortho-Cresol | 2 | 128 N-Nitrosodi-n-butylamine | 5 |
| 82 para-Cresol | 2 | 129 N-Nitrosodiethylamine | 10 |
| 83 Dibenz[a,h]anthracene | 2 | 130 N-Nitrosodimethylamine | 20 |
| 84 Dibenzo[a,e]pyrene | NA | 131 N-Nitrosomethylethylamine | NA |
| 85 Dibenzo[a,i]pyrene | NA | 132 N-Nitrosomorpholine | 10 |
| 86 m-Dichlorobenzene | 2 | 133 N-Nitrosopiperidine | 10 |
| 87 o-Dichlorobenzene | 2 | 134 N-Nitrosopyrrolidine | 10 |
| 88 p-Dichlorobenzene | 2 | 135 5-Nitro-o-toluidine | NA |
| 89 3,3'-Dichlorobenzidine | 10 | 136 Pentachlorobenzene | 10 |
| 90 2,4-Dichlorophenol | 5 | 137 Pentachloroethane | 10 |
| 91 2,6-Dichlorophenol | 5 | 138 Pentachloronitrobenzene | 10 |
| 92 Diethyl phthalate | 2 | 139 Pentachlorophenol | 50 |
| 93 3,3'-Dimethoxybenzidine | 10 | 140 Phenacetin | 2 |
| 94 p-Dimethylaminoazobenzene | 5 | 141 Phenanthrene | 2 |
| 95 3,3'-Dimethylbenzidine | NA | 142 Phenol | 2 |
| 96 2,4-Dimethylphenol | 5 | 143 2-Picoline | 20 |

Table D-5: Detection Limits for Incinerator Scrubber Water - K044 (Continued)

| BDAT CONSTITUENT | | DETECTION LIMIT |
|---|---|---|
| **SEMIVOLATILES (CONTINUED):** | | **(ppb)** |
| 144 | Pronamide | 10 |
| 145 | Pyrene | 2 |
| 146 | Resorcinol | NA |
| 147 | Safrole | NA |
| 148 | 1,2,4,5-Tetrachlorobenzene | 5 |
| 149 | 2,3,4,6-Tetrachlorophenol | 10 |
| 150 | 1,2,4-Trichlorobenzene | 5 |
| 151 | 2,4,5-Trichlorophenol | 10 |
| 152 | 2,4,6-Trichlorophenol | 10 |
| 153 | Tris(2,3-dibromopropyl) phosphate | NA |
| * | 7,12-Dimethylbenz(a)anthracene | 5 |
| * | alpha,alpha-Dimethylphenethylamine | 10 |
| * | Benzoic acid | 50 |
| * | Benzyl alcohol | 5 |
| * | 4-Chlorophenyl phenyl ether | 5 |
| * | Dibenzofuran | 2 |
| * | Dibenzo(a,h)pyrene | NA |
| * | Isophorone | 2 |
| * | 2-Methylnaphthalene | 2 |
| * | 2-Nitroaniline | 10 |
| * | 3-Nitroaniline | 10 |
| * | 2-Nitrophenol | 10 |
| * | N-Nitrosodiphenylamine | 2 |

| BDAT CONSTITUENT | | DETECTION LIMIT |
|---|---|---|
| **METALS:** | | **(ppb)** |
| 154 | Antimony | 340 |
| 155 | Arsenic | 2 |
| 156 | Barium | 3 |
| 157 | Beryllium | * |
| 158 | Cadmium | 1 |
| 159 | Chromium | 3 |
| 159 | Chromium, hexavalent | 200 |
| 160 | Copper | 10 |
| 161 | Lead | 90 |
| 162 | Mercury | 0.2 |
| 163 | Nickel | 20 |
| 164 | Selenium | 25 |
| 165 | Silver | 9 |
| 166 | Thallium | 2 |
| 167 | Vanadium | 20 |
| 168 | Zinc | 8 |
| **OTHER CONSTITUENTS:** | | **(ppb)** |
| 169 | Total Cyanide | 10 |
| 170 | Fluoride | 5 |
| 171 | Sulfide | 1000 |
| **PHYSICAL PARAMETERS:** | | |
| | Total Solids (% residue) | 0.05 |

NA The standard is not available; the compound was searched using an NBS library database of 42,000 compounds.

* This constituent is not on the list of constituents in the GENERIC QUALITY ASSURANCE PROJECT PLAN FOR LAND DISPOSAL RESTRICTIONS PROGRAM ["BDAT"], EPA/530-SW-87-011, March 1987. It is a ground-water monitoring constituent as listed in Appendix IX, Page 28639, of the FEDERAL REGISTER, Vol. 51, No. 142.

\+ The compound appears in the GENERIC QUALITY ASSURANCE PROJECT PLAN as a semivolatile constituent but was analyzed as a volatile constituent.

\+\+ The compound appears in the GENERIC QUALITY ASSURANCE PROJECT PLAN as a volatile constituent but was analyzed as a semivolatile constituent.